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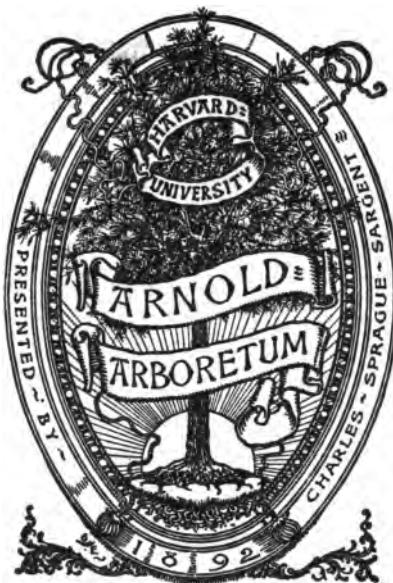
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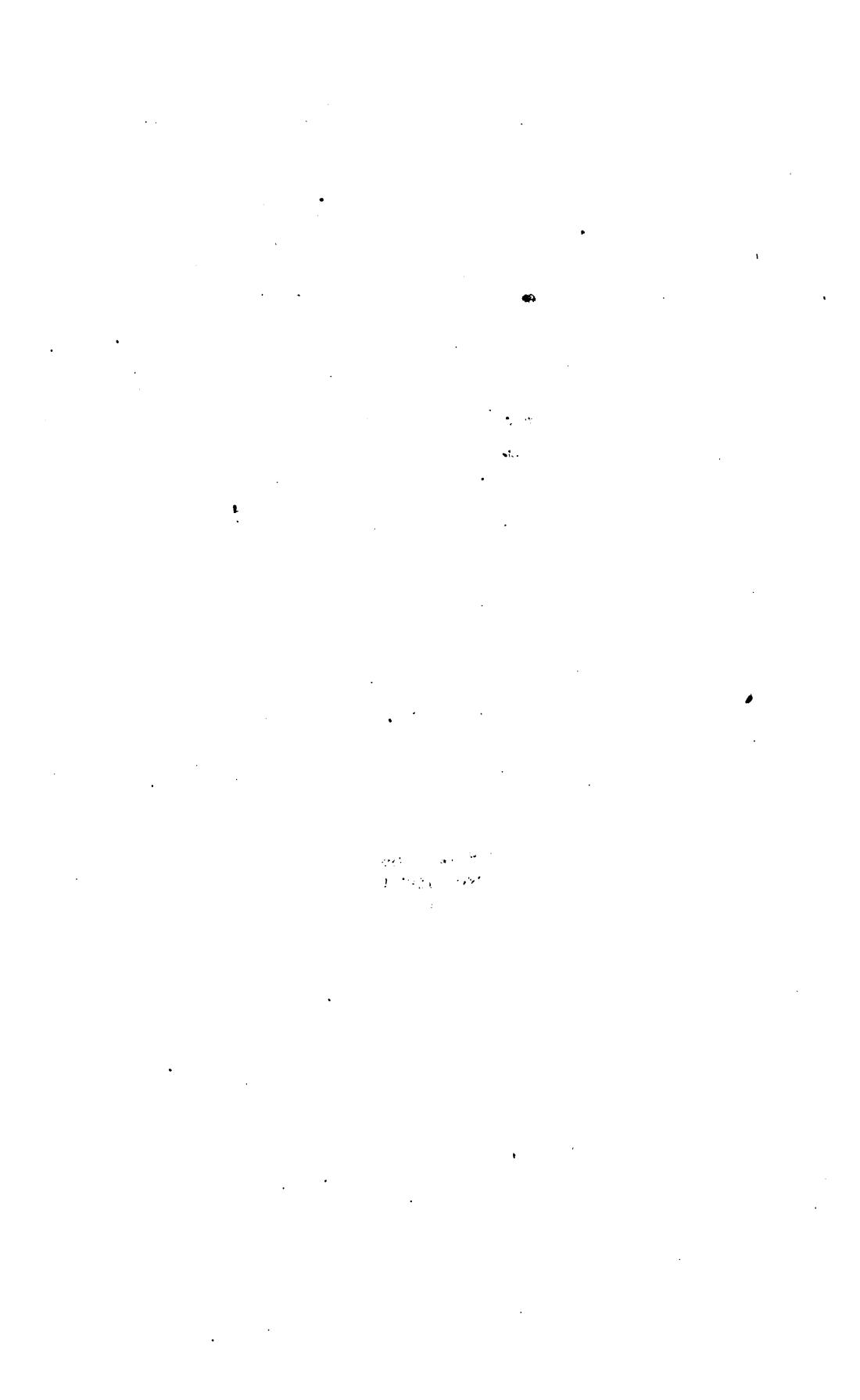
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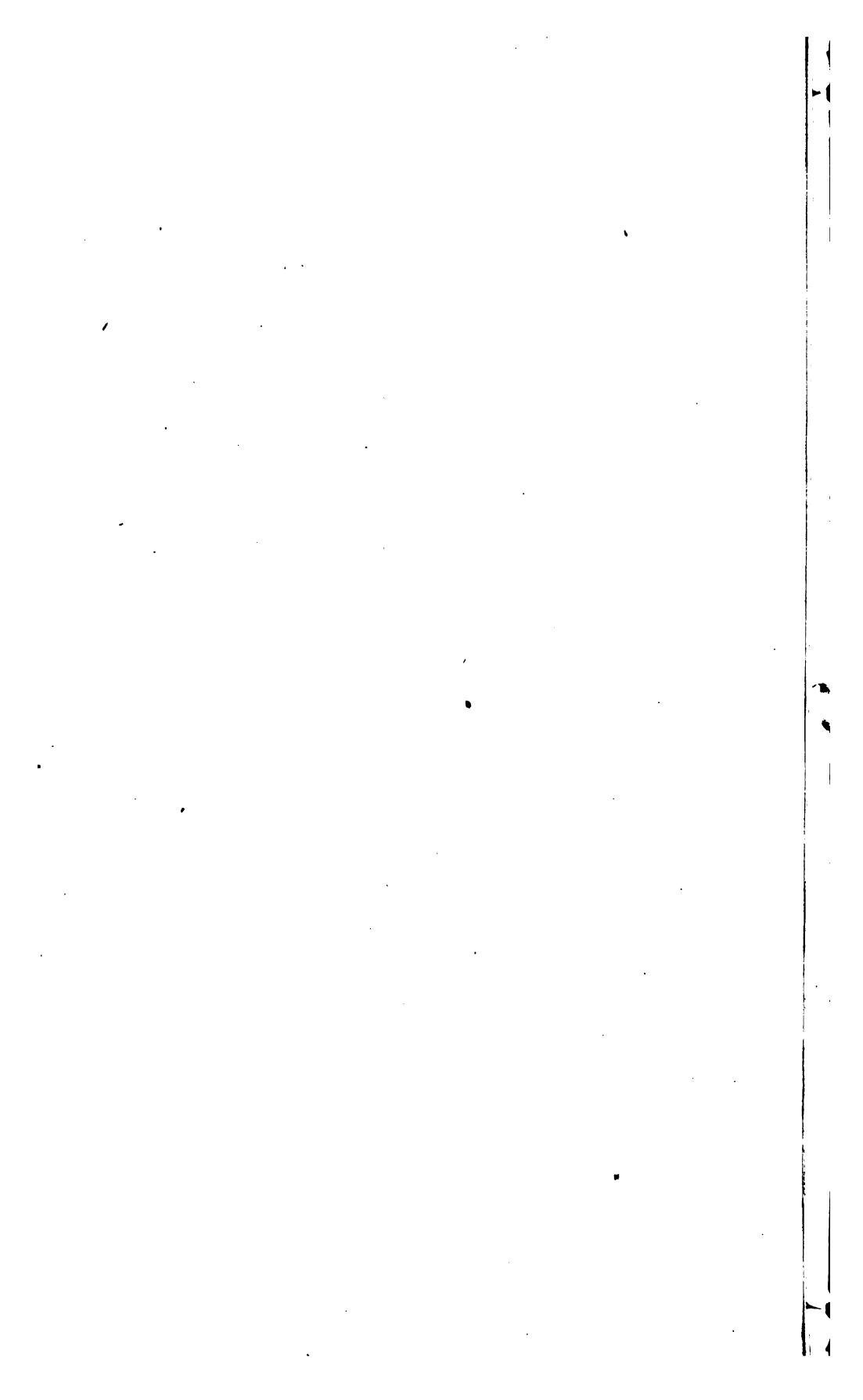
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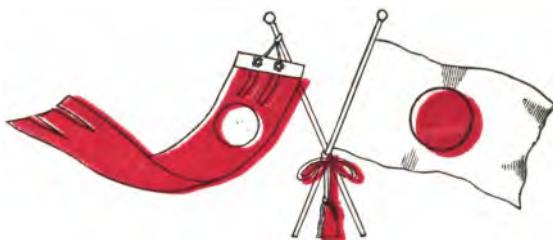




INTERNATIONAL EXHIBITION, 1876.

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AND DESCRIPTIVE NOTES ON THE

INDUSTRY AND AGRICULTURE

—OF—

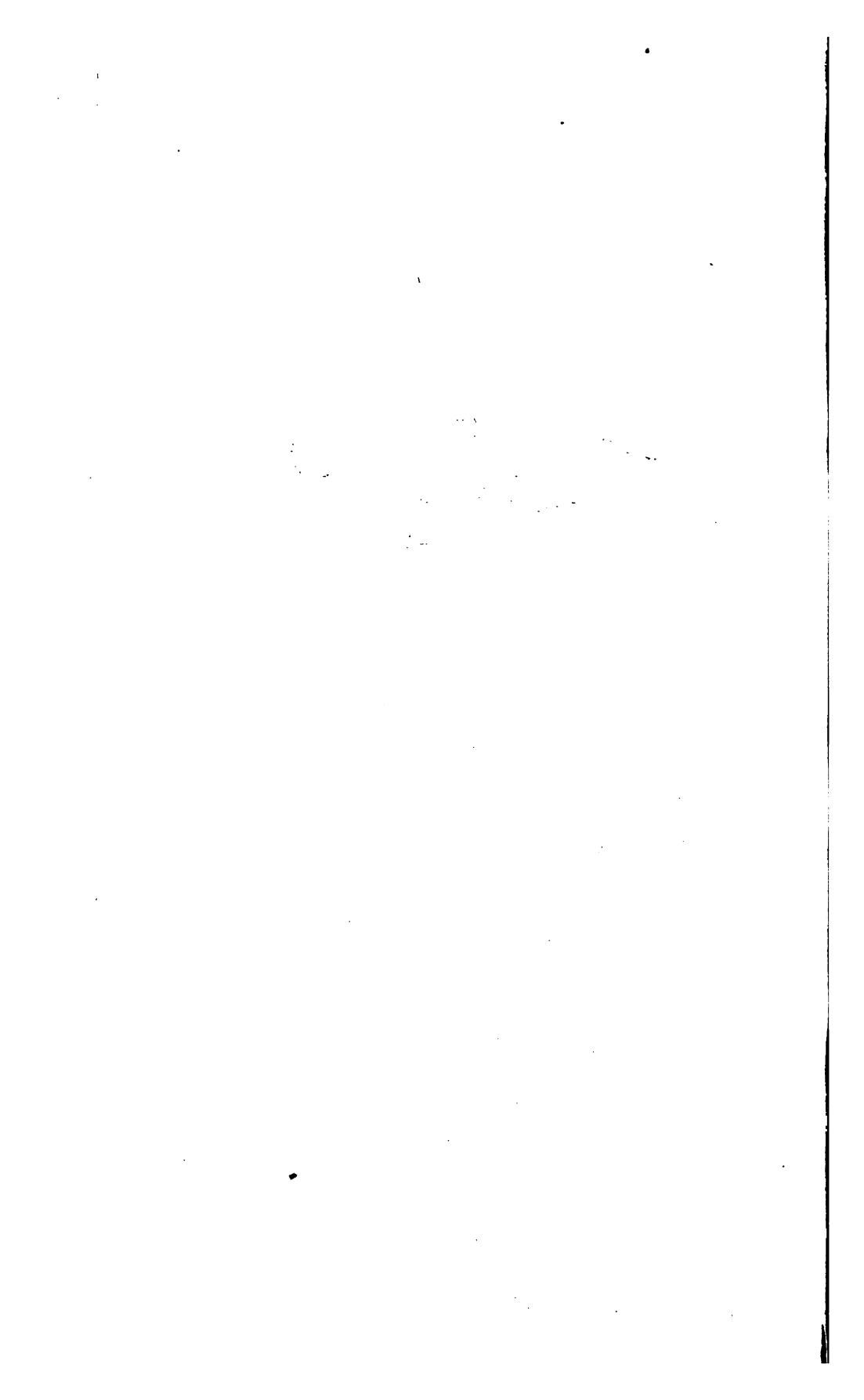
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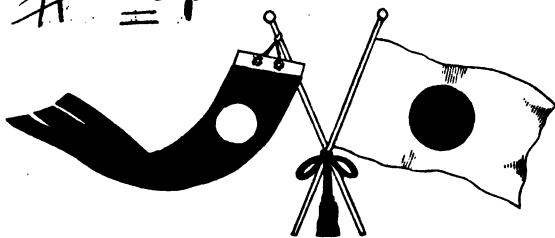
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Jan. 1914
29291

CONTENTS.

	PAGE.
Preface,	3
List of Commissioners,	5
List of Exhibitors,	7
Catalogue,	13
Descriptive Notes on the Industry and Agriculture of Japan,	87
Additional Notes,	117
Description of the Silkworm Breeding in Japan,	119
Index to Descriptive Notes,	129
Plans of the Main Building and Agricultural Building.	
Map of Japan.	

P R E F A C E.

NEVER until the year 1873, had Japan participated to any great extent in the various European International Exhibitions. Up to that time she had been merely represented by some of the provincial governments, acting independently of the central Government. However, the Government determined to be worthily represented at the Vienna International Exhibition of 1873, and notwithstanding the numerous difficulties in the way, measures were taken to exhibit a very complete collection of the produce and manufactures of the country. The Commission was not appointed until June, 1872, owing to which fact there was but little time allowed for preparations ; and further, the Japanese manufacturers being as yet ignorant of the beneficial results to be obtained, were unwilling to send their goods to a place so far away as Vienna. Consequently the Government was obliged to send officials into the various provinces with orders to buy and to collect such goods as might be suitable for exhibition.

With regard to the Philadelphia Centennial Exhibition the case was entirely different. As early as June, 1873, the Government received official intimation that an exhibition would take place at Philadelphia in 1876, and in June, 1874, it was definitely decided that Japan should participate in the said Exhibition. This was officially notified to the American Government by the Japanese Minister in Washington in Nov., 1874, and in the last month of the same year the preparations were actively entered upon. These were entrusted chiefly to those persons who, as members of the Commission of 1873, had obtained experience in the matter of exhibitions at Vienna. The office was organized in January, 1875, and established at Tokio, in a quarter of the town most conveniently situated for the despatch of goods either by rail or by water. It was decided to constitute the Imperial Commission as a department of that division of the Ministry of the Interior which is especially charged with the promotion of Industry, Commerce, and Agriculture, differing in this respect from the Vienna Commission, which was a separate department, receiving its instructions direct from supreme authority.

His Excellency Okubo, Minister of the Interior, was appointed President of the Commission in April, 1875, General Saigo receiving his nomination as Vice-President one month later.

The provincial authorities were instructed to do their utmost to induce the leading manufacturers to participate in the Exhibition, and to assist them in their preparations for the same, both with money and advice. Those of the Commissioners who had an opportunity of acquiring experience in exhibition matters at Vienna, were now able to assist the manufacturers, both in the preparation of the necessary designs and in the selection of the goods.

Moreover, the rewards, the successes and good results obtained at Vienna, had the effect of encouraging the private people to participate very largely in this Exhibition.

The value of the goods sent by them to Philadelphia is estimated at \$200,000. The Government has spent about \$30,000 in forming a government collection, and another sum of \$70,000 in making advances to various manufacturers so as to assist them in the production of such pieces of workmanship as would do credit to Japanese Art and Industry; in addition to this, a sum of \$300,000 has been appropriated for general expenses, including the cost of transport and freight.

The Government has determined not only to pay the cost of transport of all the goods to and from Philadelphia, but even to charge itself with the traveling expenses of all such exhibitors as might wish to accompany their goods. Aided in this manner by the liberality of its government, and the exertions of private people, Japan will doubtless make a creditable show of its industrial products at Philadelphia, and there is much reason for hoping that those who visited the Vienna Exhibition will be able to notice the progress effected in the short space of three years. Any opinion to this effect will be highly appreciated by both the Government and the Commission; but at the same time the latter will gladly lend an ear to any competent criticism, and will be grateful to those who will consent to assist them with their advice, and in this manner aid the Japanese nation in making a few more steps forward in the path of improvement and progress.

T H E

Imperial Japanese Commission
TO THE
INTERNATIONAL EXHIBITION AT PHILADELPHIA.
1876.

His Excellency Okubo Toshimichi, *Minister of the Interior and Privy Counselor*,
PRESIDENT.

His Excellency Lieutenant-General Saigo Tsukumichi, *Imperial Army*, VICE-PRESIDENT.

Kawase Hideharu, *Vice-President of the Board of Agriculture, Industry, and Commerce*, COMMISSIONER-GENERAL.

MEMBERS.

Tanaka Yoshio, *Ministry of the Interior.*

Sekizawa Akekio, *Board of Agriculture, Industry, and Commerce.*

Yamataka Nobuakira, " " " "

Shioda Masashi, " " " "

Suzuki Toshinobu, " " " "

Sugiyama Kadsunari, " " " "

Lieutenant Hidaka Ziro, *Imperial Army.*

Dr. G. Wagener, *Foreign adviser to the Board of Agriculture, Industry, and Commerce.*

Omori Korenaka, *Board of Agriculture, Industry, and Commerce.*

Ishiwara Toyoyasu, " " " "

Ishita Tametake, " " " "

Yamao Tsunetaro, " " " "

Kubo Hiromichi, " " " "

Fukui Makoto, " " " "

Shibata Hiroshi, " " " "

Makiyama Kohei, " " " "

Asami Tchiuga, " " " "

Ishii Yoshitaka, " " " "

Asahi Susumu, " " " "

Yosio Nagamasa, " " " "

Sasase Motoakira, " " " "

*List of Exhibitors.***HONORARY COMMISSIONERS.**

Utsunomia Saburo,
 Tokugawa Akitake,
 Komuchi Tomotsune,
 Fritz Cunliffe Owen,

*Department of Public Works.***AGENTS.**

Tomita Tetsunosuke,
 Takagi Saburo,
 Dr. David Murray,

*Vice-Consul at New York.**Vice Consul at San Francisco.**Agent of the Department of Public Education.***ATTACHES.**

Yoshikawa Nisuke.
 Akuzawa Susumi.
 Sanda Tadashi.
 Tawara Wakichiro.
 Wakai Kanesaburo.

Matsuo Iheye.

Miyagi Chiusayemon.

Yasaka Yosuke.

Asano Manzo.

Matsuo Gisuke.

JUDGES.

Hayami Kenzo,
 Notomi Kaijiro,
 Ikeda Kenzo,

Board of Agriculture, Industry, and Commerce.

" " " "

" " " "

Alphabetical List of Exhibitors.

Name.	Class.
Arai Hambaye, Tokio,	217, 405
Asada Toyemon, Kiyoto,	623
Asano Tomoshichi, Kiyoto,	217
Asaya Tonosuke, Tokio,	666
Association for women's work (Jokojo), Kizoto,	232, 242, 245, 247, 252, 254
Awo-umi Genbeye, Hiromai, Province of Mutsu,	217
Cha-ki-shosha (tea set manufactory), Kiyoto,	213, 217, 252, 405
Chemical laboratory of the city of Kiyoto,	107, 200, 660, 659
Chikuma-Ken, Local Government of,	245, 289
Cotton factory, Sakai, Province of Settsu,	665
Denshin-Riyo (Telegraphic Department), Tokio,	340
Fujikawa Gembeye, Kiyoto,	232
Fujisawa Hikobeye, Osaka,	217
Fujita Hachiroji, Province of Higo,	623

List of Exhibitors.

7

Name.	Class.
Fukami Suminosuke, Arita, Province of Hizen,	411
Fukihara Shoroku, Tokio,	213, 454
Fukuda Kichibeye, Kiyoto,	254
Fukukawa Senkichi, Totomi,	623
Fukushima Riu-ho, Tokio,	411
Funaki Sejiro, Kiyoto,	254
Gifu-Ken, Local Government of,	259
Haibara Naojiro, Tokio,	246
Hakubutsu-Kwan, Tokio,	301
Hamada-Ken, Local Government of,	259
Hasegawa Settei, Tokio,	411
Hashimoto Sejiro, Tokio,	102, 660
Hata Zoroku, Kiyoto,	443, 454
Hattori Choshichi, Tokio,	103
Hattori Zenbeye, Province of Iwami,	666
Hayashi Yuzo, Province of Tosa,	623
Hiogo-Ken, Local Government of,	289
Hirai Ikkān, Kiyoto,	217
Hirano Heiji, Province of Higo,	623
Hirano Tomiji, Tokio,	306
Hiyo-chi-yen-sha (painted Porcelain manufactory), Tokio,	213
Hojo Taheye, Kiyoto,	454
Honma Takusai, Aikawa, Province of Sado,	403
Hori Gio-kio, Province of Mino,	623
Hosoda Zenbeye, Kiyoto,	252
Hotta Zuisho, Kiyoto,	289, 405
Ichida Rihachi, Kiyoto,	247
Ide Zenbei, Kiyoto,	405
I-ida Jubei, Nagoya, Province of Owari,	213
Ikebe Kinsuke, Mineyame, Province of Tango,	247
Ikebe Seibeye, Inakimura, Province of Ise,	264
Imai Kinyemo, Province of Totomi,	623
Imai Riheye, Kiyoto,	405
Inagaki Tobeye, Kiyoto,	247
Ishi-oka Sojiro, Noshiro, Province of Ugo,	217
Ito Tameji, Sendai, Province of Rikuzen,	246
Iwada Hambeye, Kiyoto,	289
Iwahashi Kichiyemon, Kuroi-mura, Province of Kii,	217
Iwai Zensaburo, Nara, Province of Yamato,	254
Izukura Kayemon, Kiyoto,	247
Ji-ami Joyen, Kiyoto,	254

List of Exhibitors.

Name.	Class.
Jo-ami Hiyoshiro, Kiyoto,	254
Kageshima-Ken, Local Government of,	623
Kaitaku-shi (Department for the Colonization of the Island of Yesso),	100, 620, 656
Kaku Seiji, Province of Higo,	623
Kambayashi Sansho and Sanniu, Uji, Province of Yamashiro,	623
Kamimura Norisato, Province of Higo,	623
Kamsaki, Tokio,	660
Kanaya Gorosaburo, Kiyoto,	452, 454
Kanoko-shosha, Kiyoto,	247
Kanzan Denshichi, Kiyoto,	213
Kashiu Sampei, Iganomura, Province of Awaji,	210-12
Katakura Jin-ichiro, Province of Hitachi,	623
Katayama Genzaburo, Kiyoto,	254
Kato Gosuke, Tajimimura, Province of Mino,	213
Kawai Shingoro, Province of Omi,	623
Kawamura Yahei, Arimatsu, Province of Owari,	281
Kawamura Yasabei, Kiyoto,	405
Kawanabe Giosai, Tokio,	411
Kawarabayashi Hidekuni, Kiyoto,	405
Kikuchi Kuhei, Tokio,	217
Kikuchi Yosai, Tokio,	411
Kimura Genshichi, Kiyoto,	247
Kimura Hiyo-sai, Kiyoto,	217, 254
Kimura Tosuke, Kiyoto,	254
Kinkozan Sobei, Kiyoto,	213
Kiriu-Kosho-Kuwaisha, (First Japanese Manufacturing and Trading Co.),	
Tokio, 202, 213, 217, 218, 227, 246, 247, 252, 253-4-5-8-9, 261, 264-5, 268, 269, 289, 301, 327, 340, 344, 403, 405, 411, 443, 452, 454, 623, 647.	
Kishi Seppo, Tokio,	411
Kitakaze Uu, Higo, Province of Settsu,	666
Kiyoto-su (Municipality of Kiyoto),	259, 623
Kobori Choju, Province of Higo,	623
Kobu-sho (Department of Public Works), Tokio,	206
Kochi-Ken, Local Government of,	259
Kojima Sadashichi, Kiyoto,	242
Komura Sachi, Kanazawa, Province of Kaga,	342
Koran-sha (Porcelain Manufactory), Arita, Province of Hizen,	213
Koseki Isaburo, Kiyoto,	247
Koshima Isami, Tokio,	201
Kozan-Riyo (Mining Department), Tokio,	100, 101, 120, 320

List of Exhibitors.

9

Name.	Class.
Kumagai Kiubeye, Kiyoto,	268, 443, 655
Kuroda Naoshichi, Province of Higo,	623
Kuroki Yasutake, Okojimura, Province of Hiuga,	623
Kuwangiyo-jo (Association for the encouragement of Art and Manufactures), Kiyoto,	245, 254, 430, 623
Kuwangiyo-Riyo, (Imperial Board of Agriculture, Industry, and Commerce), Tokio, 104, 201, 218, 223, 229, 254, 259, 272, 306, 321, 330, 600, 602, 610, 620, 621, 623, 624, 645, 646, 652-3, 656-7-8-9, 670, 672, 700, 701-2-3, 707, 708, 722, 733.	
Kuwangiyo-Riyo-no-Yozan-Kakari (Government office for experimental silk worm breeding), Tokio,	668
Kuwangiyo-Riyo-Shikenjo (Experimental Section of the Board of Agriculture, Industry, and Commerce), Tokio,	217
Kuwappan Kiyoku (Government Printing Office), Tokio,	411
Maino Rihachi, Province of Omi,	623
Makudzu Kozan, Yokohama,	405
Marunaka Magohei, Kanazawa, Province of Kaga, 213, 217, 405, 452, 454, 623, 668	
Maru Takabumi, Province of Iwami,	668
Mashimidsu Zoroku, Kiyoto,	213
Matsu-moto Tetsuzo, Tokio,	264
Matsu-o Ihey, Tokio,	343, 600
Matsuya Hirohachi, Tokio,	660
Matsuzaki Soichi, Kondo Masayuki, and others, Tokio,	201
Megata Kai-an, Tokio,	411
Minobe Chiubeye, Kiyoto,	623
Minoda Chiojiro, Tokio, 210-12-13, 217, 218, 226, 254, 261, 268, 403, 405, 411, 443	
Mitsu-i Hachiroyemon, Kiyoto,	254
Miura Gensuke, Province of Mino,	623
Miyagawa Chojiro, Tokio,	254
Miyagawa Toranosuke, Ota, near Yokohama,	210-12-13
Miyazaki Tominosuke, Province of Hizen,	623
Miye-Ken, Local Government of,	232
Mombusho (Department of Public Education), Tokio,	
	300, 301, 302, 304, 305 306, 320, 322
Mori Yogo-yemon, Yokkaichi, Province of Ise,	213
Mori Rokubeye and Ito Kenichi, Tokio,	660
Morikawa Koyemon, Province of Yechizen,	623
Morita Buhey, Kiyoto,	245
Murakami Torajiro, Kiyoto,	217, 218, 254, 289
Nabeshima Senkichi, Mineyama, Province of Tango,	247
Naga-oka Zenpachi, Tokio,	660
Nagasaki Suiho, Tokio,	411

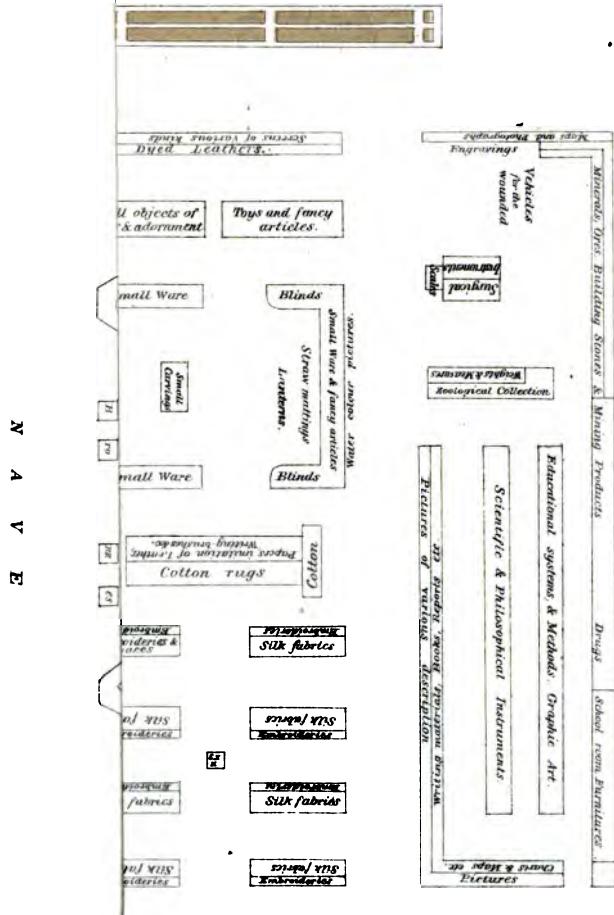
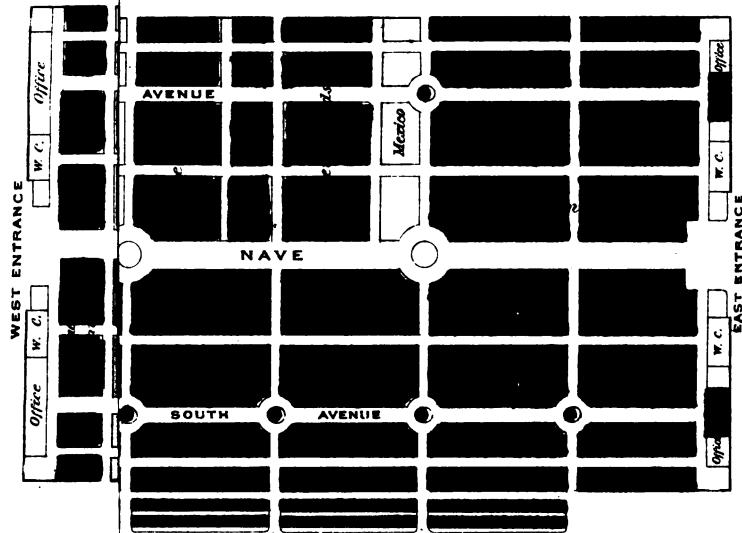
Name.	Class.
Nagasaki-Ken, Local Government of,	623, 647
Nagata Yeinoshin, Tokio,	289
Nagaya Buyemon, Kiyoto,	623
Nagura Orizo, Kiyoto,	650
Nakagawa Joyeki, Kiyoto,	405
Nakagawa Yoheye, Kiyoto,	245
Nakamura Hachirobeye, Kiyoto	217
Nakamura Magohei, Nagahama, Province of Omi	247
Nakashima Riyokei, Kagoshima, Province of Satsuma,	210-12
Nakatsuji Tarobeye, Kiyoto	243
Nakayama Magoshichi, Kuwana, Province of Ise,	213
Namikawa Seiyemon, Kiyoto,	254
Namikawa Yasu-uki, Kiyoto,	254
Nara-Ken, Local Government of,	233
Nara Yazayemon, Kiyoto,	276-77
Nawa Saburoyemon, Akita, Province of Ugo,	246
Negishi Manzo, Tokio,	405
Ni-igata-Ken, Local Government of,	233
Nishijin Weavers' Society, Kiyoto,	245, 246 247
Nishigori Kiuhei, Nagahama, Province of Omi,	247
Nishimura Jihei, Kiyoto,	247
Nishimura Soichiro, Mikuriya, Province of Hoki,	452
Nishimura Soyemon, Kiyoto,	245, 246, 247, 252, 411
Nishio Matsutaro, Kiyoto,	661
Noda Daigoro, Kumamoto, Province of Higo,	623
Nose Giheye, Kiyoto,	243
Nuishosha (Embroiderers' Society), Kiyoto,	252
Numata Masa-uki, Tokio,	411
Okura-Sho (Finance Department), Tokio,	322
Okuyama Kichibeye, Komatamura, Province of Ise,	264
Ono Gosaburo, Naniwa-mura, Province of Settsu,	230
Osaka-fu (Municipality of Osaka),	232, 623
Ota Mankichi, Tokio,	217
Otori Mizen, Province of Hiuga,	623
Oyama Kiuhei, Chijibu, Province of Musashi,	103
Ozaki Iheye, Shidsu-ōka, Province of Suruga,	623
Riku-gunsho (Imperial War Department), Tokio,	278
Rinami Hanzo, Kiyoto,	254
Riu-Kiu-han (Loochoo Island),	217, 230, 231, 232, 233, 259, 666
Saga-Ken, Local Government of,	626
Saito Zenbei, Tokio,	405

List of Exhibitors.

11

Name.	Class.
Sakaguchi Seibeye, Kiyoto,	252, 411
Sakai-Ken, Local Government of,	230
Sakai Torazo, Kiyoto,	430
Sato Ichiye, Province of Yechigo,	623
Sato Shusei, Province of Yechigo,	623
Sawada Zembeye, Tomo, Province of Bingo,	660
Saifu Yoheye, Kiyoto,	213
Sei-shi-jo (The Silk Reeling Establishment), Kiyoto	242
Sekiyo-Kuwaisha (Petroleum Co.), Tokio,	101
Shibata Yosaburo, Hakata, Province of Chikuzen,	246
Shichijo Yasunori, Kiyoto,	405
Shiga-Ken, Local Government of,	289, 623
Shiino Shobeye, Yokohama,	247, 252
Shikki-shosha (Lacquered Ware Manufactory), Kiyoto,	217, 254
Shimidsu Jiheye, Kiyoto,	289
Shimidsu Kameshichi, Kiyoto,	213
Shimidsu Rokubeye, Kiyoto,	213
Shimidsu Shichibeye, Kiyoto,	213
Shinoyama Atsuwoki, Kiyoto,	405
Shinoyama Atsu-uki, Kiyoto,	405
Shiokawa Bunrin, Kiyoto,	411
Shippo Kuwaisha (Cloissónné Enamel Manufactory), Nagoya,	213, 254, 452
Province of Owari,	254, 452
Shirakawa-Ken, Local Government of,	623
Shiromidsu Chozayemon, Hakata, Province of Chikuzen,	246
Shitomi Sohei, Yokkaichi, Province of Ise,	213
Shiushi-Kiyoku (National Archive Office), Tokio,	335
Shokko-jo (Establishment for Silk Manufactory), Kiyoto,	246
Shomi Yeisuke, Kiyoto,	405
Sozei-Riyo (National Revenue Department), Tokio,	345
Suiro-Riyo (Hydrographic Department), Tokio,	335
Sumii Zenjiro, Kiyoto,	254
Sumiyama Isuke, Kiyoto,	246, 252
Suzuki Chokichi, Tokio,	405
Suzuki Hiyakunen, Kiyoto,	411
Suzuki Mosuke, Tokio,	254, 405
Suzuki Soichi, Province of Hiuga,	623
Suzuki Yasubeye, Yokohama,	210-12
Suzuki Yojiyemon, Yamura, Province of Kai,	245, 247
Taizan Yoheye, Kiyoto,	213
Takahashi Dohachi, Kiyoto,	213
Takamura Rokujiro, Province of Totomi,	666

Name.	Class.
Tamai Chiuzo, Province of Mino,	306
Tamamura Yasujiro, Ishiimura, Province of Shimodzuke,	668
Tanaka Honi, Tokio,	411
Tanaka Katsutaro, Province of Chikugo,	623
Tanaka Riheyē, Kiyoto,	252, 411
Tanzan Seikai, Kiyoto,	213
Tei-ami Teigiyo, Kiyoto,	254
Terada Gorobeye, Kiyoto,	254, 289
Teramura Sukeyemon, Kiyoto,	252
Todai-Riyo (Light House Department), Tokio,	335
Tomita Seisuke, Kiyoto,	247
Toyo-oka-Ken, Local Government of,	289
Tsubaki Yoshi, Sendai, Province of Rikuzen,	246
Tsuboi Chozo, Nagahama, Province of Omi,	247
Tsuji Choyemon, Kiyoto,	213
Tsuji Katsuzo, Arita, Province of Hizen,	405
Tsuruga-Ken, Local Government of,	245, 259
Uyemura Soroku, Tsuruga, Province of Yechizen,	217
Yamamoto Ichirobeye, Wakamatsu, Province of Iwashiro,	405
Yamamoto Kinu, Susaka, Province of Shinano,	245
Yamamoto Yasubeye, Shizu-oka, Province of Suruga, 217, 254, 268, 289, 405, 452	
Yamazaki Tosen, Tokio,	411
Yanagida Kuhei, Province of Yechigo,	623
Yebihara Yomohei, Province of Hitachi,	623
Yehara Teizo, Kiriu, Province of Kodzuke,	245
Yeiraku Zengoro, Kiyoto,	213
Yeisei-Kiyoku (Board of Public Health), Tokio,	107
Yekitei-Riyo (General Post Office), Tokio,	335, 345
Yomo Yasunosuke, Kiyoto,	452
Yoshida Kuwanbeye, Kiyoto,	259
Yoshida Sojiro, Mineyama, Province of Tango,	247
Yoshida Yasubeye, Kiyoto,	405
Yozanjo (Silk Worm Breeding Establishment), Kiyoto,	242
Wada Yoshimoto, Tokio,	202
Wage Kitei, Kiyoto,	213
Wakamatsu Rinshiro, Minakuchi, Province of Omi,	251
Watanabe Matsukichi, Kami-idsumi, Province of Hitachi,	623
Watanabe Sokichi, Shiroishi, Province of Iwaki,	233
Wobanawa Manyemon, Tokio,	254
Womura Igugoro, Province of Hiuga,	623
Zohei-Riyo (Imperial Mint), Osoka,	344



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CATALOGUE

—OF—

JAPANESE EXHIBITS.

DEPARTMENT I.—MINING AND METALLURGY.

MINERALS, ORES, BUILDING STONES AND MINING PRODUCTS.

Class 100.—Minerals, Ores.

Kozanriyo (Mining Department), Tokio.

1. Gold, silver, iron, copper, tin, lead, and zinc ores, also metals reduced from the ores. Bioxide of manganese, alum earth and alum, malachite, mica, antimony ores, sulphur, crude and refined. List of mines in Japan.

Kaitakushi (Department for the colonization of the Island of Hokkaido or Yesso).

2. Collection of minerals from Hokkaido.
3. Geological collection from Hokkaido.

Class 101.—Mineral Combustibles.

Kozanriyo (Mining Department), Tokio.

4. Coals and anthracite.

Seki-yu Kuwaisha (Petroleum Co.), Tokio.

5. Mineral oils, crude and refined.

Class 102.—Building Stones.

Hashimoto, Tokio.

6. Building stones.

Class 103.—Lime, Cement, &c.

K. Oyama, Chichibu, Province of Musashi.

7. Lime stone and quick lime.
8. Samples of mortars.

Class 104.—Minerals used in Ceramic Art

Kuwangiyo-Riyo (Imperial Board of Agriculture, Industry, and Commerce), Tokio.

9. Clay, china-stone, Kaolin, Silex, and other minerals used in the manufacture of the pottery and porcelain of Hizen, Owari, and Ise.

Class 107.—Mineral Water.

The Chemical Laboratory, of the City of Kyoto.

10. Natural Carbonated Water.

Yeisei-Kiyoku (Board of Public Health), Tokio.

11. Statistical statements on Mineral Waters.

DEPARTMENT II.—MANUFACTURES.

CHEMICALS.

Class 200.—Pharmaceutical Preparations.

The Chemical Laboratory of the City of Kyoto.

1. Various compounds of mercury, zinc salts, sugar of lead, blue and green vitriol, ammonia and its salts, tartar emetic, ethyl nitrite, alkaline salts, etc.

Class 201.—Oil and Wax, etc.

Kuwangiyo Riyo (*Imperial Board of Agriculture, Industry and Commerce*), Tokio.

2. Vegetable oils prepared for food and for lighting, with samples of the raw materials.
3. Vegetable wax, crude and bleached. Wax candles.

S. Matsu-zaki, Y. Yorita and M. Kondo, Tokio.

4. Soap.

I. Koshima, Tokio.

5. Shark liver oil.

Class 202.—Paints, Colors, etc.

Kiriu - Kosho - Kuwaisha (*first Japanese Manufacturing and Trading Company*), Tokio.

6. Japanese ink (Chinese ink).

Y. Wada, Tokio.

7. Indigo and specimens of dyed silk.

CERAMICS.—POTTERY, PORCELAIN, ETC.

Class 206.—Bricks.

Kobu-sho (*Department of Public Works*), Tokio.

8. Bricks.

Ch. Minoda, Tokio.

11. Collection of ancient pottery.—Flower vases and flower pots, cups, plates, bowls, jugs, bonboniers, tea sets, braziers, futamomo (bowls with cover) and ornaments, etc.

Class 210-12.—Earthenware, Stoneware and Faience, etc.

R. Nakashima, Kagoshima, province of Satsuma.

9. Flower vases, tea jars, tea sets, tazzas, cigar stands and ornamental pieces.

Kashiu Sampei, Igano-mura, province of Awaji.

10. Flower vases, coffee sets, cups, bonboniers, futamomo (bowls with cover), cigar stands, candlesticks, etc.

T. Miyagawa, Ota near Yokohama.

12. Flower vases, censers, and bowls with cover, etc., manufactured by Makudzu Kozan.

Y. Suzuki, Yokohama.

13. Painted earthenware.—Flower vases and flower pots, bowls with cover, tea jars, coffee sets, plates, censers, lamp vases, ornamental pieces, etc., manufactured by Makudzu Kozan.

Class 213.—Porcelain.

Shitomi Schei, Yokka-ichi province of Ise.

14. Banko-ware. Tea pots of all descriptions, coffee sets, water jugs, cigar stands, flower vases, flower pots, large bowls, cake boxes, and ornamental objects.

Y. Mori, Yokka-ichi, province of Ise.

15. Banko-ware. Flower vases, tea pots, and bowls, etc.

M. Nakayama, Kuwana, province of Ise.

16. Flower vases, cake boxes and dishes.

Kato Gosuke, Tajimimura, province of Mino.

17. Cups, covered bowls, flower vases and flower pots, etc.

S. Fukihara, Tokio.

18. Cloisonné enamel on porcelain.—Flower vases and flower pots of various sizes and forms, covered dishes and bowls, water jugs, sugar bowls, tea pots, and jars of various descriptions, etc.

Koran-Sha (*Porcelain manufactory*), Arita, province of Hizen.

19. Mikawachi yaki. Cups and flower vases manufactured at Mikawachi.

20. Flower vases of various sizes (one of them 10 feet high), large vases, basins, dishes, tea and coffee services, lamp vases, etc., manufactured by Y. Fukagawa.

21. Flower vases and flower pots of different sizes and forms, bowls of various kinds, dishes, plates, jars, tea and coffee services, lamp pedestals and ornamental pieces, manufactured by S. Fukami, K. Tsuji, and others.

Chaki-Shosha, (*Tea set manufactory*), Kyoto.

22. Tea pots, cups, jars, flower vases and flower pots, etc.

Tanzan Seikai, Kyoto.

23. Flower vases, flower pots, tea, coffee, and dinner sets, jars, canakins, cigar stands, chandeliers, jewel cases, covered bowls and photographs on porcelain.

Kinkozan-Sobei, Kyoto.

24. Flower vases, flower pots, coffee services, cake boxes, plates and jewel cases, etc.

Takahashi Dohachi, Kyoto.

25. Flower vases, flower pots, tea and coffee sets, covered bowls, dishes, etc.

Shimidzu Rokubei, Kyoto.

26. Flower vases, covered bowls, tazzas, vases, tea jars and tea sets, candle-sticks, bottles and jars, etc.

Kanzan Denshichi, Kyoto.

27. Flower vases, tea and coffee sets, incense cases, pitchers, plates, cake boxes, painted tablets, etc.

Wage Kitei, Kyoto.

28. Cigar stands, vases, flower pots, tea and coffee sets, covered bowls, large basins, etc.

Mashimidzu Zoreku, Kyoto.

29. Flower vases, flower pots, covered dishes, bowls, cake boxes, etc.

Shimidzu Shichibei, Kyoto.

30. Tea and coffee cups and saucers, milk jugs, sugar bowls, flower vases, etc.

Shimidzu Kameshichi, Kyoto.

31. Tea and coffee sets.

Z. Yeiraku, Kyoto.

32. Bowls, flower vases, and flower pots, sake bottles, tea pots, egg cups, tea and coffee cups, milk jugs, jewel cases, bowls with cover, etc.

Ch. Tsuji, Kyoto.

33. Toilet services.

Taizan Yohei, Kyoto.

34. Flower vases, flower pots, table and tea sets, tazzas, etc.

Seifu Yehel, Kyoto.

35. Flower vases and flower pots, coffee sets, cake boxes, bowls with cover, etc.

M. Marunaka, Kanazawa, province of Kaga.

36. Flower vases and flower pots, plates, coffee and tea sets, large tea jars, cake boxes, bowls with covers, tazzas, etc., made by G. Wateya.

37. Large bowls, manufactured by Y. Yoshida.

38. Flower vases, flower pots, tea and coffee cups, bowls with covers, made by P. Awo.

39. Flower vases, coffee and tea cups, bowls with lids, made by T. Hekizan.

40. Tea jars, coffee sets, manufactured by S. Seikan.

41. Flower vases, cake boxes, manufactured by A. Kachoken.

42. Coffee cups, flower pots, etc., manufactured by T. Shozu.

43. Coffee cups, tea pots, tea cups and flower vases, manufactured by A. Setzuzan.

44. Cake boxes, lamp vases, flower vases, coffee and dinner sets, manufactured by S. Haruna.

45. Coffee sets made by Munesaki.

46. Cups, flower vases, flower pots, cake boxes, lamp vases, etc., manufactured by K. Utsumi.

47. Bowls with covers, coffee cups, etc., made by Yamakishi.

48. Coffee and tea pots, manufactured by Chiuji.

49. Tea pots, lamp vases, etc., manufactured by I. Sekitei.

50. Large bowls with lids, flower vases, coffee cups, made by the Kaga association for the encouragement of manufactures.

51. Flower vases, cigar stands, tea and coffee sets, made by K. Shinoda.

Hiyochiyen-sha, (manufactory of painted porcelain), Tokio.

52. Flower vases, flower pots, coffee and tea sets, dishes, bowls with or without covers, plates, cigar stands, painted tables and ornaments, etc.

Shippo-Kuwaisha, (Cloisonné enamel manufactory), Nagoya, province of Owari.

53. Cloisonné enamel on porcelain. Flower vases, flower pots, tea and coffee cups, cake boxes, etc., manufactured by C. Takenouchi.

T. Miyagawa, Ota, near Yokohama.

54. Flower vases, lamp vases, coffee sets, covered bowls, manufactured by Makudzu Kozan.

Ch. Minoda, Tokio.

55. Collection of old and new porcelain. Flower vases, flower pots, sake bottles, bowls with and without covers, plates, vases, jars, etc.

T. Iida, Nagoya, province of Owari.

56. Large tables, flower vases, and flower pots, etc., manufactured by Kawamoto Masukichi.

57. Porcelain tab'ets, flower vases, flower pots, censers, tea and coffee sets, pitchers, bowls, vases, basins, screens and okimono (ornamental pieces), etc.

Kiriu-Kosho-Kuwaisha (first Japanese manufacturing and trading Co.), Tokio.

58. Flower vases made at Owari and Hizen and decorated at Tokio.

59. Collection of ancient pottery and porcelain. Flower vases, plates, fruit dishes, pitchers, ladies, bottles, bowls with or without covers, tea services, tables, braziers, and other objects.

**FURNITURE AND OBJECTS OF GENERAL USE IN CONSTRUCTION
AND DWELLING.**

Class 217.—Furniture and Lacquered Ware.

K. Iwahashi, Kuroimura, province of Kii.

60. Lacquered ware for household use.—Bowls of various kinds, trays, cake boxes, lunch boxes, etc.

G. Awoumi, Hiromai, province of Mutzu.

61. Lacquered utensils. Incense holder, paper boxes and stands, letter holders, glove boxes, jewel cases, various trays, lunch boxes, chop-sticks, and samples illustrating the process of lacquering.

H. Fujisawa, Osaka.

62. Lacquered lunch boxes and trays of all sorts.

S. Ishioka, Noshiro, province of Ugo.

63. Trays, sake, tea and coffee cups, cake and lunch boxes, incense boxes and dishes, paper boxes, small étagères, ornamental tablets, specimens of the lacquer ware called Shunkei-nuri.

S. Uyemura, Tsuruga, province of Yezhizen.

64. Lacquered ware, so called Wakasanuri.—Trays, tea boxes, chop-sticks, small étagères, bureaus and paper boxes, etc.

Riukiu-han, (the island of Loo Choo.)

65. Lacquered plates and bowls, incense boxes, lunch boxes, etc., etc.

Kuwangiyo-Ryo-Shi-ken-jo (experimental section of the board of agriculture, industry and commerce), Tokio.

66. Cabinets and toilet table of foreign style.

H. Arai, Tokio.

67. Lacquered furniture.—Ink boxes, paper boxes and stands, book cases, table for the Kammuri, (ancient style of head dress), backgammon tables, fan holders, étagères, bureaus, sword racks, jewel cases, needle boxes, cloth and towel horses, chairs, card boxes, cigar stands, braziers, tables, trays, plates, flower vases, screens, walking sticks, etc., etc.

Kiriu-Koshō-Kuwaisha, (first Japanese manufacturing and trading Co.), Tokio.

68. Lacquered étagères, bureaus, tablets, incense boxes, plates, cake boxes, bowls, trays, cups, flower vases, screens, boxes and cases for various purposes, samples of plain and gold paintings in lacquer.

69. Collection of old lacquer-ware.—Incense boxes, trays and dishes, poetry boxes, ink boxes of various description, paper boxes, desks, pen holders and other articles of stationery, several kinds of boxes and cases, seal cases, étagères, bureaus, screens, flower vases, okimono (ornamental objects), trays, plates, dining tables and bowls, water jugs, decanters, cups, tea boxes and tea cups, cake boxes, cigar cases and boxes, smoking materials, braziers, saddle and stirrups, etc.

Ch. Minoda, Tekio.

70. Etagères, bureaus, book cases, letter and paper boxes, ink boxes, desks, tables, pen cases and stands; incense boxes, dishes and other accessories for incense burning, cigar boxes, smoking materials, card boxes, masks, seal cases, sword racks, fan holders, tablets, okimono (show pieces), arm cushions, chairs, folding and not folding screens, dining tables, bowls, plates, cups, trays, urns, lunch boxes, teajars and boxes, tazzas, napkin rings, etc. Toilet tables and cases, looking-glass stands, towel horses, etc. Saddles and stirrups, etc.

71. Decorative objects, for instance, pictures on silk, painted screens, ornamental objects of rock crystal, etc.

Y. Yamamoto, Shizuoka, province of Suruga.

72. Lacquered furniture, ornamented with incrusted mother of pearl shell. Bureaus, tables, glove boxes, cigar cases, trays, fish dishes, etc., etc.

73. Old lacquered folding screens, sword racks, drawers, boxes.

Chaki-Shosha, Kiyoto.

74. Tea services, cake boxes, incense boxes, ink boxes, etc.

Shikki-Shosha, (Lacquered ware manufactory), Kiyoto.

75. Etagères, bureaus, ink boxes, letter and paper boxes, seal cases, card boxes, flower vases, trays, plates, cups, bread and cake boxes, lunch boxes, etc.

H. Kimura, Kiyoto.

76. Cigar cases.

Hirai Ikkān, Kiyoto.

77. Coffee sets.

T. Asano, Kiyoto.

78. Flower vases.

H. Nakamura, Kiyoto.

79. Cake boxes and cake trays, bowls, etc.

T. Murakami, Kiyoto.

80. Two boards showing various kinds of lacquering.

M. Marunaka, Kanazawa, province of Kaga.

81. Flower vases and cups manufactured by S. Mori.

82. Round trays, cake boxes, cigar stands and cases made by K. Yoshimura.

Kikuchi-Kuhei, Tokio.

83. Hat racks, chairs, picture frames, paper boxes, walking sticks, ornamented with gold lacquer.

M. Ota, Tokio.

84. Furniture and cabinet work. Cabinets étagères, book cases, picture frames, screens tables, pillows, cake box, etc.

Class 218.—Table Furniture.

Kuwangiyo-Riyo (*Imperial Board of Agriculture, Industry and Commerce*), Tokio.

85. Iron utensils imitated from ancient bronze ware. Kettles, alcohol lamp, and incense burner, manufactured by Nagoshi Yagoro, Tokio.

Kiru Kosho Kuwaisha (*first Japanese Manufacturing and Trading Company*), Tokio.

86. Silver tea sets. Tea pots, tea cup stands, water jugs, vases and natsume (small box for holding tea).

T. Murakami, Kyoto.

87. Tin flower vases and jars, lacquered and decorated by engravings in the lacquer.

Ch. Minoda, Tokio.

88. Silver tea kettle.

Class 219.—Apparatus for Lighting.

Kuwangiyo Biyo (*Imperial Board of Agriculture, Industry and Commerce*), Tokio.

89. Lanterns, manufactured at Owari and Tokio.

Class 226.

Ch. Minoda, Tokio.

90. Bath tubs and accessories.

Class 227.—Manufactured Parts of Building.

Kiru Kosho Kuwaisha (*first Japanese Manufacturing and Trading Company*), Tokio.

91. Blinds and screens manufactured at Tokio.

YARNS AND WOVEN GOODS OF VEGETABLE OR MINERAL MATERIALS.

Class 229.—Coarse Fabrics.

Kuwangiyo Biyo (*Imperial Board of Agriculture, Industry and Commerce*), Tokio.

92. Checkered, striped, and plain mats, manufactured at Bingo.

Class 230.—Cotton Yarns and Fabrics.

Local Government of Sakaiken.

94. Monpa cloths, bleached and dyed; yarns. G. Ono, Naniwamura, province of Settsu.

95. Canvas.

Riu-kuu-han (*Loochoo Island*).

96. Cotton cloths, fancy and plain white.

Class 231.—Dyed Cotton Fabrics.

Riu-kuu-han (*Loochoo Island*).

97. Cotton cloths, striped.

Y. Kawamura, province of Owari.

98. Cotton cloths, dyed and spotted.

Class 232.—Cotton Prints and Calico.

Osaka fu (*Municipality, Osaka*).

99. Cotton rugs, figured by intersection of warp and woof made by T. Nogii.

100. Cotton rugs, printed, made by U. Hoshino. Local Government of Miye-ken.

101. Tsu moji (cotton gauze, mixed with hemp) Association for women's work, (*Jokojo*), Kyoto.

102. Cotton rugs, figured.

G. Fuji-kawa, Kyoto.

103. Chiji mi (twisted cotton cloth with a mixture of silk).

Riu-kuu-han (*Loochoo Island*).

104. Cotton cloth, printed.

Class 233.—Linen and other Vegetable Fabrics.

S. Watanabe, Shiro-ishi, province of Iwaki.

105. Shifu-cloth, striped and plain white; samples of the paper yarn.

Hiu-ku-han (Loochoo Island).

106. Ramie cloth, plain white, striped and gauze. Plantain fibre cloth.

Local government of Ni-i-gata-ken.

107. Ramie cloth, bleached, unbleached and striped.

Local government of Nara ken.

108. Hemp cloth, bleached.

SILKS AND SILK FABRICS.

Class 242.—Cocoon and Raw Silk.

Yosan-jo (Silk-worm Breeding Establishment), Kiyoto.

109. Raw silks.

Sci-shi-jo (the Silk Reeling Establishment), Kiyoto.

110. Raw silks.

Association for Women's work, Kiyoto.

111. Raw silks.

S. Kojima, Kiyoto.

112. Silk thread and fishing lines.

Class 243.

G. Nose, Kiyoto.

113. Gold and silver threads, (gilt paper twisted round cotton or silk threads.)

T. Nakatsu-ji, Kiyoto.

114. Braids used in embroidery.

Class 245.—Plain Woven Silk.

Yo. Suzuki, Yamura, province of Kai.

115. Kaiki (dress silks.)

116. Kohaku (dress silks.)

Local Government of Tsurugaken.

117. Hoshio-tsumu-gi (plain white dress silk).

T. Yehara, Kiri, province of Kotsuke.

118. Kohaku (dress silk).

Local Government of Chikuma-ken.

119. Yamamai silk.

Yamamoto Kinu, Susakamura, province of Shinano.

120. Bombyx sho-chiu silk.

Y. Nakagawa, Kiyoto.

121. Chijimi (corrugated plain white silk).

B. Morita, Kiyoto.

122. Chijimi, dyed.

S. Nishimura, Kiyoto.

123. Fancy dress silk, (une-ori), purple and pink.

The Nishijin weavers, Kiyoto.

124. White fancy dress silk (aya-ori), corrugated dress silk (ohijira), and other plain silks, (donsu and shusu).

Association for Women's work, Kiyoto.

125. White dress silks (Ri-u-mon and several kinds of kinu).

Kuwangiyo-jo (Association for the encouragement of arts and manufacture), Kiyoto

126. White dress silk (habutai).

Class 246.—Figured Silk Goods.

Y. Shibata, Hakata, province of Chikuzen.

127. Plain dress silk (Hakata).

128. Striped dress silk (ditto).

Ch. Shiromidzu, Hakata, province of Chikuzen.

129. Dark blue dress silk (Hakata).

130. Striped dress silk (Hakata).

S. Nawa, Akita, province of Ugo.

131. Fancy dress silk (U-ne-ori).

T. Ito, Sendai, province of Rikuzen.

132. Plain white and checkered dress silk (Yatsuhashi).

S. Nishimura, Kiyoto.

133. Plaid dress silk (Kohaku-ji) and screens.

The Nishijin weavers, Kiyoto.

134. Samples of silk goods.

135. Brocades and striped dress silk.

The Shokkojo weavers, (*Establishment for silk manufactures*), Kiyoto.

136. Striped and figured dress silk (Kohaku and Shusu).

I. Sumiyama, Kiyoto.

137. Checkered dress silk (Sumiyama-ori).

Kiriu-Kosho-Kuwaisha (*first Japanese Manufacturing and Trading Company*), Tokio.

138. Silk carpetings and brocades.

Tsubaki Yoshi, Sendai, province of Rikusen.

139. Striped shot dress silk (Sei-ko-ori).

Class 247.—Crapes, Velvets, etc.

J. Nishimura, Kiyoto.

140. Crapes and chijimi (corrugated silk) dyed and figured.

S. Nishimura, Kiyoto.

141. Crapes, dyed and figured, and samples of dyed crapes.

The Nishijin weavers, Kiyoto.

142. Velvets and gauze.

S. Tomita, Kiyoto.

143. Gauze.

The Kanokoshosha, Kiyoto.

144. Dyed and spotted crapes (Kanoko).

R. Ichida, Kiyoto.

145. Dyed and spotted crapes.

S. Shii-no, Yokohama.

146. Handkerchiefs, cravats, and tobacco pouches, made of crape.

Y. Suzuki, Yamura, province of Kai.

147. Handkerchiefs.

Kiriu-Kosho-Kuwaisha (*first Japanese manufacturing and trading Company*), Tokio.

148. Cravats.

Association for women's work, Kiyoto.

149. Cravats,

S. Yoshida, Mineyama, province of Tango.

150. Crapes, purple and white.

S. Nabeshima, Mineyama, province of Tango.

151. Crapes, scarlet, black and dark blue.

K. Ikebe, Mineyama, province of Tango.

152. Crapes, scarlet, purple, pink, light brown, and white, etc.

K. Nishigori, Nagahama, province of Omi.

153. Crapes, white.

M. Nakamura, Nagahama, province of Omi.

154. Crapes, white.

C. Tsuboi, Nagahama, province of Omi.

155. Crapes, white.

G. Kimura, Kiyoto.

156. Crapes.

T. Inagaki, Kiyoto.

157. Crape, white.

Class 249.—Braids.

I. Koseki, Kiyoto.

158. Braids.

K. Izu-kura, Kiyoto.

159. Watch guards.

CLOTHING AND ORNAMENTS, ETC.

Class 251.—Hats.

B. Wakamatsu, Minakuchi, province of Omi.

160. Hats made of the bast of Wisteria chinensis.

Class 252.—Embroideries.

Z. Hosoda, Kiyoto.

161. Silk embroidery.

S. Sakaguchi, Kiyoto.

162. Silk embroidery.

163. Screens, embroidered.

S. Nishimura, Kiyoto.

164. Silk embroidery, embroidered tablets, table cloths.

165. Screens embroidered.

Cha-ki-shosha, Kiyoto.

166. Embroidered picture of Buddha, embroidered silk carpeting, silk pieces and pin cushions.

S. Teramura, Kiyoto.

167. Embroidered table cloths and shawls.

I. Sumiyama, Kiyoto.

168. Embroidered silks.

Kiriu-Kosho-Kuwaisha (*first Japanese manufacturing and trading Company*), Tokio.

169. Table cloths and embroidered silks.

S. Shii-no, Yokohama.

170. Embroidered silks, coverlets and dressing gowns.

Association for women's work, Kiyoto.

171. Pin cushions, embroidered table cloth and screens.

Nuisho-sha, (*Embroiderers' Society*), Kiyoto.

172. Screens, silk and pin cushions, embroidered.

R. Tanaka, Kiyoto.

173. Table cloths, curtains, embroidered.

174. Screens, embroidered and ornamented with Kiritorii-Saiku. (Pictures composed of small pieces of silk.)

Class 253.—Ornament.

Kiriu-Kosho-Kuwaisha, (*first Japanese manufacturing and trading Co.*), Tokio.

175. Crystal necklaces, earrings, buttons, ornamental images and stamp, etc., made by **M. Asakura**, Tokio.

Class 254.—Toys and Fancy Articles, Small Objects of Adornments.

Kuwangiyo-Riyo, Tokio.

176. Ornamental piece, made of rock crystal.

The Shikki-shosha, Kiyoto.

177. Articles for children, as Hanaguruma, small cabinets, chests, boxes, etc.

Z. Iwai, Nara, Province of Yamato.

178. Round fans.

Kiriu-Kosho-Kuwaisha, (*first Japanese manufacturing and trading Co.*), Tokio.

179. Cigar cases, card cases, buttons, match boxes, chains, purses, valises, wallets, cabinets, yarn cases, small boxes, lunch boxes, pipes, letter boxes, boxes for keeping tea-sets, hair-pin boxes, jars, trays, incense boxes, letter holders, bamboo tops, toys, umbrellas, all manufactured at Tokio.

Ch. Minoda, Tokio.

180. Articles for children, like hasami-baoo (chest), and other boxes, and ornamental images. Pipes, buttons, pocket books, cigar stands, Koshi, (toys), fans, folding and not folding, brush holders, book cases, card cases, cabinets, carved ivory images, and bracelets, etc.

C. Miyagawa, Tokio.

181. Portfolios, wallets, cigar cases, pins, purses, chains, fans, watch cases, cups, pipes, seal boxes, canes, buttons, etc.

Association for women's work, Kiyoto.

182. Kiritorii-Saiku (the pictures in relief being composed of small pieces of silk, pasted upon paper), and implements for this kind, of work.

183. Wallets, tobacco pouches.

K. Fukuda, Kiyoto.

184. Kiritorii-saiku pictures.

G. Katayama, Kiyoto.

185. Kiritorii-saiku ornaments.

M. Wobanawa, Tokio.

186. Fans, not folding, ornamented with Oshiye. (kind of Kirite-ri).

Shippo Kuwaisha, Nagoya, province of Owari.

187. Fans, folding.

T. Kimura, Kiyoto.

188. Fans, not folding.

Z. Sumii, Kiyoto.

189. Fans, not folding.

Kuwangiyo-jo, (*Association for the encouragement of art and manufactures*), Kiyoto.

190. Fans, not folding.

191. Tobacco pouches, cages, hand balls.

Jiami Joyen, Kiyoto.

192. Fans.

Tei-Ami Tegiyo, Kiyoto.
 193. Fans.
 Jo-Ami Heishiro, Kiyoto.
 194. Fans.
 Rin-ami Hanzo, Kiyoto.
 195. Fans.
 T. Murakami, Kiyoto.
 196. Walking canes.
 G. Terada, Kiyoto.
 197. Pipes.
 S. Namikawa, Kiyoto.
 198. Birds and other toys of Ke-uye-Saiku,
 (imitation of animals, the hair or feathers
 made from hemp and silk threads).
 S. Funaki, Kiyoto.
 199. Birds and any other toys of Ke-uye-Saiku.

Y. Yamamoto, Shidzu-oka, province of Su-
 ruga.
 200. Cages made of bamboo.
 M. Suzuki, Kiyoto.
 201. Buttons, etc.
 H. Mitsui, Kiyoto.
 202. Pictures, composed of small pieces of silk.
 H. Kimura, Kiyoto.
 203. Note tablets.

Class 255.—Fancy Leather Work.

Kiriu-Kosho-Kuwaisha, (*first Japanese man-
 ufacturing and trading Co.*), Tokio.
 204. Leather boxes, manufactured at Himeji,
 and figured deer-skins.

PAPER, BLANK BOOKS AND STATIONERY.

Class 258.—Stationers' Articles.

Kiriu-Kosho-Kuwaisha, (*first Japanese man-
 ufacturing and trading Co.*), Tokio.
 205. Specimens of writing brushes.

Class 259.—Writing Paper.

Local government of Kochi-ken.
 206. Specimens of paper.
 Local government of Hamada-ken.
 207. Specimens of paper.
 Kyoto-Fu, (*Municipality Kiyoto*).
 208. Paper, various kinds of, manufactured by
 G. Yasui and others.
 Liu-Kiu-han, (*Loo Choo Island*).
 209. Paper, made of plantain fibre and straw.
 Local government of Gifu-ken.
 210. Writing paper, manufactured by H. Goto
 and others.
 Local government of Tsuruga-ken.
 211. Paper, various kinds of; manufacturer, S.
 Kobayashi.

Kuwangijo-Riyo, (*Imperial board of agri-
 culture, industry and commerce*), Tokio.

212. Paper, various kinds of.
 Kiriu-Kosho-Kuwaisha, (*first Japanese
 manufacturing and trading Co.*), Tokio.
 213. Paper, collection of various kinds.
 K. Yoshida, Kiyoto.
 214. Shikishi and Tan-zaku (thick colored and
 ornamented paper for writing poetry).

Class 261.—Blank Books, etc.

Kiriu-Kosho-Kuwaisha, (*first Japanese
 manufacturing and trading Co.*), Tokio.
 215. Blank books.
 Ch. Minoda, Tokio.
 216. Albums.

Class 264.—Wall Papers and Imitation of Leather, etc.

S. Ikebe and K. Okuyama, Inakimura and
 Komatamura, province of Ise.

Tsubo-ya Kami (imitation of leather), different kinds of.	N. Haibara, Tokio.
Kiriukosho-kuwaisha, (first Japanese manufacturing and trading co.), Tokio.	T. Matsumoto, Tokio.
218. Wall papers.	219. Wall papers.

MILITARY ARMAMENTS.

Class 265.

Kiriukosho-kuwaisha (first Japanese Manufacturing and Trading Company), Tokio.
221. Coat of mail.

Class 268.—Knives, Swords, etc.

Kiriukosho-kuwaisha, Tokio.
222. Swords, spears, etc.
Ch. Minodo, Tokio.
223. Swords.

K. Kumagai, Kiyoto.

224. Halberds.

Y. Yamamoto, Shidzu-oka, province of Suruga.

225. Swords.

Class 269.

Kiriukosho-kuwaisha (first Japanese Manufacturing and Trading Company), Tokio.
226. Bows and arrows.

MEDICINE, SURGERY.

Class 272.

Kuwangyo-Riyo (Imperial Board of Agriculture, Industry and Commerce), Tokio.
227. Drugs and medicines.

Class 276.

Y. Nara, Kiyoto.
228. Surgical instruments.

Class 277.

Y. Nara, Kiyoto.
229. Dental instruments.

Class 278.

Rikugunsho (Imperial War Department).
230. Vehicles and litters for the transportation of wounded soldiers.

FABRICS OF VEGETABLE, ANIMAL, OR MINERAL MATERIALS.

Class 289.—Wooden and Basket Ware.

Local Government of Hiogo-ken.
231. Bamboo work.—Trays, vases and baskets, etc., manufactured at Arima.

Local Government of Toyo-oka-ken.

232. Straw work.—Boxes, book cases and cabinets, etc., manufactured by D. Yamata.

Local Government of Shiga-ken.

233. Basket ware of Wisteria chinensis bast.—Mats, cake boxes, and boxes, etc.
Y. Nagata, Tokio.

234. Rattan work.—Trays.
Y. Yamamoto, Shidzu-oka, province of Suruga.

235. Bamboo work.—Kudsuya (model of a country seat), trays, book-cases and other boxes, etc. Trays made from the stems of the common ferns.
Kiriukosho-kuwaisha (*first Japanese Manufacturing and Trading Company*), Tokio.

236. Wooden ware and ikkan-bari (kind of card board work).—Boxes, cases, etc.

J. Shimidsu, Kiyoto.

237. Bamboo ware.—Bonbonières, cigar cases, trays and glove boxes.
T. Murakami, Kiyoto.

238. Bamboo ware. Writing boxes, glove boxes, etc.
G. Terada, Kiyoto.

239. Bamboo ware.—Tea pot.
H. Iwada, Kiyoto.

240. Bamboo ware.—Cigar cases.
Z. Hotta, Kiyoto.

241. Bamboo ware.—Brush holders and stands.
Local government of Chikuma-Ken.

242. Bamboo ware, made by R. Miyazaka.

DEPARTMENT III.—EDUCATION AND SCIENCE.

EDUCATIONAL SYSTEMS, METHODS AND LIBRARIES.

Class 300.—Elementary Instruction.

Mombusho (*Department of Public Education*), Tokio.

1. Educational systems and methods.
2. Constitution of the Japanese educational department and maps showing the divisions.
3. Elementary school books and apparatus.
4. Chairs and tables, etc., for schoolrooms.
5. Infant training and toys.
6. Reading and writing implements, such as were used by children in former times.
7. Maps, charts, globes, etc.
8. Educational equipments.—Tables, pens, ink boxes, blank books, paper and other stationery.
9. Abacus, arithmetical board, slates, pencils, etc.
10. Examination paper for students.
11. Designs and photographs of schools.

Class 301.—Botany and Zoology.

Hakubutsukan (*Museum*), Tokio.

12. Zoological collection. Mammalia, birds, insects and shells, etc.

13. Sectional specimens of woods.
14. Collection of leaves of various plants.
15. Books on botany.—Nippon sanbutsu-shi (book on agricultural products), oshiyegusa (guide to manufactures), and other pamphlets.
16. Tabular statements of botanical classification.
17. Moku-zai-sho-ran (album showing samples of the various woods used for industrial purposes).
18. Artificial fruits made by O. Masaki.

Mombusho (*Department of Public Education*).

19. Maps. Historical accounts and catalogue of the botanical gardens at Tokio.
- Kiriukosho-kuwaisha (*first Japanese Manufacturing and Trading Company*).
20. Ancient copper wares.—Kiyozutsu (cylindrical case for sacred books), rings, tubs and pitchers, etc., some of them 1000 years old.

Class 302.—*Medicine, Surgery, Art and Design.*

Mombusho (*department of public education*).

21. Ancient and modern medical and surgical books, and modern surgical instruments made by K. Iwashiya.
22. Medicines and drugs.
23. I-in zas-si (miscellaneous reports of the hospital pertaining to the medical academy).
24. Anatomical designs.
25. Paintings and painting materials.
26. Lacquer work, showing process of manufacture and implements used.
27. Wood engravings and engraving tools, blocks and types; printing materials.
28. Photographs.

Class 304.—*Reports and Statistics.*

Mombusho (*department of public education*).

29. Outline of the history of education in Japan. History of literature and short historical sketch of the educational department. All accompanied by the English translation.
30. Educational regulations, notifications, reports, miscellaneous information, and Eiji-ko-tei (educational reports by F. Tanaka).
31. Statistical table showing the number of public and private schools with their scholars, tabular statement of the revenue and expenditure of the public schools and the public school property and other statistical tables relating to education.

Class 305.—*Libraries.*

Mombusho (*department of public education*).

32. Photographs, history, regulation and catalogue of Tokio library.

Class 306.—*Books and papers.*

Mombusho (*department of public education*).

33. Almanacs, histories, dictionaries, and illustrated works on natural history, etc.
34. Newspapers, journals and magazines, etc.

Kuwangiyo-riyo (*imperial board of agriculture, industry and commerce*).

35. Tabular statement showing number of national newspapers.

T. Hirano, Tokio.

36. Collection of type and paper matrices used in printing.

C. Tamai, province of Mino.

37. Somoku-zusetsu (illustrated work on the flora of Japan).

Class 320.—*Scientific Instruments and Methods.*

Mombusho (*department of public education*).

38. Geometrical instruments.
39. Apparatus for experiments in natural philosophy.

Kozan-riyo (*mining department*), Tokio.

40. Meteorological reports.

Class 321.

Kuwangiyo-riyo (*imperial board of agriculture, industry and commerce*).

41. Counting machine.

Class 322.

Mombusho (*department of public education*).

42. Measures of length, capacity and weight.

Okurasho (*finance department*).

43. Graduated scales of bamboo and brass, measures of capacity, scales and graduated beams for weighing.

Class 327.

Kiriukosho-kuwaisha (*first Japanese manufacturing and trading company*), Tokio.

44. Musical instruments.—Japanese harps, drums, violin, samisen, flute, kind of flagolet, and other flutes.

Class 330.—*Engineering, Charts, Maps and Graphic Representations.*

Kuwangiyo-riyo (*imperial board of agriculture, industry and commerce*).

45. Diagrams, showing the means of arresting and controlling the flow of water.

46. Plan of water supply at the city of Tokio.

Class 385.

Shiu-shi-kiyoku, (national archive office),
Tokio.

47. Map of the Empire of Japan.

Todai-riyo, (lighthouse department), Tokio.

48. Photographs of lighthouses, maps showing
their location, and notifications and tables
with English translation.

Yeki-tei-riyo, (general post office), Tokio.

49. Map, showing the mail routes.

Suiryo-riyo, (hydrographic department), Tokio.

50. Marine and coast line charts.

Denshin-riyo, (telegraph department), Tokio

51. Map, showing telegraphic lines and stations.

Class 340.—Physical, Social and Moral
Condition of Man.

Kirinoko-sho-kuwai-sha, (first Japanese
manufacturing and trading co.), Tokio.

52. Utensils used at Cha-no-yu, (ceremonical
tea party,—Kettles, portable furnaces, coal
scuttle, cups, and other accessories.) In-
cense burners, dish, tray, and other things.
Poetical books, writing paper, ink boxes,
and other articles used at poetical “bees.”

53. Games and manly sports.—Card, chess,
backgammon, dice, bow and arrows, and
play-shells, etc.

Class 342.

5. Komura, Kanazawa, province of Kaga.

54. Japanese model house on the exhibition
grounds, built by I. Matsuo.

Class 343.

I. Matsuo. Tokio.

55. Bazar on the exhibition ground.

Class 344.

Zohei-riyo, (imperial mint,) Osaka.

56. Collection of gold-and silver coins.

Kiriuko-sho-kuwai-sha, (first Japanese man-
ufacturing and trading co.), Tokio.

57. Collection of old copper coins.

Class 345.

Yeki-tei-riyo, (general post office), Tokio.

58. Postal cards and stamps. Annual reports.

Seizeiriyo, (national revenue department).

59. Revenue stamps, blank papers, and licenses
etc.

DEPARTMENT IV.—ART.

SCULPTURE.

The objects classified under this heading, ought to have been exhibited in the Art Gallery. It has,
however, been found more convenient to place them in the Main Building.

Class 408.—Metal Work.

Honma Takusai, Sado island.

1. Bronze statuette, tea trays, braziers, small
basins, bowl with cover, cigar stands, and
vases.

Kiriuko-sho-kuwai-sha, (first Japanese man-
ufacturing and trading co.), Tokio.

2. Bronze plates, censer, teacup stands, Fudetate,
and Shakutate (cylindrical pen cases),
manufactured by K. Yamada, at Tokio.

3. Bronze teacup stands, brazier and samples of
tinted bronze, manufactured by Gorosaburo,
at Kiyoto.

4. Bronze vase, manufactured by Saito Zenbeye,
at Tokio.

5. Bronze tablet, with engraved figure, man-
ufactured by Ch. Suzuki, at Tokio.

6. Bronze vases, manufactured by T. Yamamoto,
at Kanazawa, province of Kaga.

Ch. Minodo, Tokio.

7. Bronze censer, Chojiburo (kind of censer)
silver cages, tobacco cage and kettle.

Class 405.—Carving in Wood, Ivory, and Metal.

Kirin-ko-sho-kuwai-sha, (*first Japanese manufacturing and trading co.*), Tokio.

8. Bronze fountain, manufactured by Chokichi, Torakichi, and Hakusai, at Tokio.

9. Large bronze censers, and vases, manufactured by Ch. Suzuki at Tokio.

10. Bronze vases, manufactured by Momose, at Tokio.

11. Bronze vases, manufactured by Z. Daikoku, at Tokio.

12. Imitation of old bronze.—Paper weights, pipes, and jug.

M. Marunaka, Kanazawa, province of Kaga.

13. Bronze vases, manufactured by Ch. Hiraoka at Kanazawa, province of Kaga.

14. Bronze vases, and censer, manufactured by K. Yamakawa, at Kanazawa, province of Kaga.

15. Bronze vases, and braziers, manufactured by Mizuno Genroku, at Kanazawa, province of Kaga.

16. Silver cake box, manufactured by Z. Tsuzawa, at Kanazawa, province of Kaga.

17. Bronze censer and candlesticks, manufactured by Z. Shirasaki, at Takaoka, province of Echii.

18. Vases and basins, manufactured by S. Kanamori, at Takaoka, province of Echii.

19. Bronze censer, and candlesticks, manufactured by R. Muroya, at Takaoka, province of Echii.

20. Bronze censer, manufactured by Ya. Yokoyama, at Takaoka, province of Echii.

21. Metal pipe, paper weight, and statue.

H. Arai, Tokio.

22. Silver vase, Chojibro. (kind of censer), and decorative objects.

The Chaki-sho-sha Co., Kiyoto.

23. Bronze vessel.

Ya. Yoshida, Kiyoto.

24. Bronze vases and censers.

Nakagawa Joyeki, Kiyoto.

25. Bronze kettle, vase, and sweet meat boxes, etc.

Kanaya Gorosaburo, Kiyoto,

26. Bronze kettle, vases, and sweet meat boxes.

Y. Shomi, Kiyoto.

27. Bronze vases and trays.

A. U. Shinoyama, Kiyoto.

28. Bronze sweet meat box.

A. O. Shinoyama, Kiyoto.

29. Bronze sweet meat box.

Kawara-bayashi Hidekuni, Kiyoto.

30. Bronze jug.

Ya. Kawamura, Kiyoto.

31. Metal teapot, cup, and cup stand.

Z. Saito, Tokio.

32. Bronze censer, vases, Fudetate, tablet with engraved picture and ornamented images.

I. Yamamoto, Wakamatsu, province of Iwashiro.

33. Bronze vases.

CARVING IN WOOD AND IVORY.

Kirin-kosho-kuwai-sha, (*first Japanese manufacturing and trading co.*), Tokio.

34. Miniature palace made of sandal wood, statues, trays, vases, engraved tablet, carved wooden stands for ornaments, small cabinet and card cases, etc.

Imai Bihei, Kiyoto.

35. Carved ivory images.

The Chakishosha Co., Kiyoto.

36. Ivory incense box.

Z. Hotta, Kiyoto.

37. Ivory paper weight and tray.

Shichijo Yasunori, Kiyoto.

38. Carved and colored wooden statuettes.

Z. Ide, Kiyoto.

39. Carved wooden statuettes dressed in silk.

Y. Yamamoto, Shizuoka, province of Suruga.
 40. Carved ivory images, made by Giokuzan.
 M. Suzuki, Tokio.
 41. Ivory vase, boat and other decorative objects carved by Reigie-ku at Tokio.
 42. Ivory vase carved by Mitsuakira at Tokio.
 43. Ivory boats carved by Riochin and Reigoku at Tokio.
 44. Ivory statuettes, carved by T. Yamaguchi at Tokio.
 45. Ivory statuettes, carved by Hakumin at Tokio.
 46. Small ivory images, carved by Yeirakuken, Shunkosai and Ikeda at Tokio.
 Negishi Manso, Tokio.
 47. Carved wooden bedstead and bedroom furniture.
 Makudsu Kozan, Yokohama.
 48. Porcelain mouldings.
 Tsuji Katsuzo, Arita, province of Hizen.
 49. Porcelain mouldings.

Class 411.—Water Color Pictures.

Kikuchi Yosai, Tokio.
 50. Water color picture.
 Tanaka Honi, Tokio.
 51. Water color picture.
 Fukushima Riuho, Tokio.
 52. Water color picture.
 Kishi Seppo, Tokio.
 53. Water color picture.
 Kawanabe Giosai, Tokio.
 54. Water color picture.
 Hasegawa Settei, Tokio.
 55. Water color picture.
 Megata Kahan, Tokio.
 56. Water color picture.
 Yamazaki Tosen, Tokio.
 57. Water color picture.
 Nagasaki Suiho, Tokio.
 58. Water color picture.
 Numada Masa-ki, Tokio.
 59. Water color picture.

Kiriu-kosha-kuwaisha, (first Japanese manufacturing and trading company), Tokio.

60. Album of lacquer paintings, by Shibata Zeshin and of water color paintings by Watanabe Seisai, at Tokio.
 61. Pictures and album of pictures.
 Ch. Minoda, Tokio.
 62. Pictures and album of pictures.
 Suzuki Hiyakunen, Kiyoto.
 63. Pictures.
 R. Tanaka, Kiyoto.
 64. Picture album.
 Shi-o-kawa Bunrin, Kiyoto.
 65. Picture.
 S. Nishimura, Kiyoto.
 66. Pictures.
 S. Sakaguchi, Kiyoto.
 67. Pictures.

Class 418.—Paintings with Vitrifiable Colors.

Fukami Suminosuke, Arita, province of Hizen.

68. Painted porcelain.

Class 421.—Line Engravings.

Kuwappankiyoku (government printing office).
 69. One set of four copper plates for the reverse of the government bonds. Original plate engraved by acids.
 70. One set of four copper plates for the reverse of the government bonds. Electro matrix.
 71. One set of four copper plates for the reverse of the government bonds. Electro matrix.
 72. One copper plate for the obverse of the government bonds. Electroplated with iron.
 73. One set of three copper plates for the licenses issued to wholesale dealers in tobacco.
 74. One set of ten copper plates for revenue stamps for tobacco.
 75. One set of twelve and one-half plates for printing revenue stamped wrappers for packages of tobacco.
 76. Samples of types set up. Paper matrix and stereotype plate taken from the above.

77. Two sample sheets printed from the foregoing.
 87. One sample of type set up.
 79. Paper matrix and stereotype plate of the above.
 80. Two sheets printed from the foregoing.
 81. Sample page set up.
 82. Historical sketch of the Kuwappankiyoku (government printing office), from its commencement.
 83. Fifteen type matrices.
 84. Five rough samples of the same.
 85. Three wooden models for type matrices.
 86. One ledger.
 87. One index to the above.
 88. One cash account book.
 89. One history of Nippon (Japan). Sample binding.
 90. One code Napoleon, in Japanese, and ornamented binding.
 91. One code Napoleon, in Japanese, bound in plain calf.
 92. One collection of poetry. Sample binding.
 93. One portfolio. Sample binding.
 94. One Buckle's history of civilization; in Japanese, and sample binding.
 95. One blank book ruled.
 96. One school book. Sample in foreign style.
 97. One school book, in national style.
 98. Eight sheets of government bonds called "Chitsuroka." Four for obverse and four for reverse.
 99. Two sheets of land warrants, obverse and reverse.
 100. Eleven sheets of postage stamps, each consisting of 40 stamps.
 101. Two postal cards.
 102. Eight sheets of receipt stamps.
 103. Two sheets of silk worm egg cards with government stamps, each consisting of forty stamps.
 104. Four sheets of licenses, two for obverse and other two for reverse.
 105. Four sheets of tobacco stamps, issued to tobacco dealers. Each sheet consisting of eight stamps.
 106. One revenue stamped wrapper for packages of tobacco.

Class 430.—Photographs.

T. Sakai, Kiyoto.
 107. Photographs,

Kuwangiyo-jo, (*association for the encouragement of art and manufactures*), Kiyoto.

108. Photographs.

Class 448.—Artistic Castings.

Kiriukosho-kuwai-sha (*first Japanese manufacturing and trading company*), Tokio.

109. Bronze vases, manufactured by S. Momose, at Tokio.

110. Bronze vase and statue, manufactured by Somin, at Tokio.

111. Bronze jar, manufactured by Z. Saito, at Tokio.

112. Old bronze, miniature tower, crane, braziers, candlestick, vases, tray, tripod kettle, and censer.

113. Statuette, Kiozutsu (cylindrical cases for sacred books), Hando (water jar with spout), crane, pot and bronze casts. Manufactured at Hiroshima. All imitation of old bronze.

114. Vase, imitation of old bronze, by Sakasho, at Tokio.

115. Tripod kettle, imitation of old Chinese bronze by Zoroku, at Kiyoto.

116. Bronze tray, manufactured by J. Nakagawa, at Kiyoto.

117. Bronze pot, imitation of old bronze, manufactured at Hiroshima, province of Aki.

Ch. Mineda, Tokio.

118. Bronze censers, candlesticks, pots, basins, and trays, etc.

119. Bronze large vases and miniature tower, manufactured by To-riyo-sai at Kawagoye province of Musashi.

120. Bronze censers, manufactured by K. Tanaka, at Tokio.

121. Bronze vases and candlestick, manufactured by Ya. Yokoyama at Takaoka, province of Echii.

H. Zoroku, Kiyoto.

122. Bronze statuettes, tripod kettles.

K. Kumagai, Kiyote.

123. Bronze vases.

Class 452.—Inlaid work.

S. J. Nishimura, Mikuria, province of Hoki.

124. Inlaid work in wood.—Glove box, album, etc.

Y. Yamamoto, Shizuoka, province of Suruga.

125. Inlaid work in wood.—Book cases, cabinets, and table, etc.

Kiriu-kosho-kuwai-sha (*first Japanese manufacturing and trading company*), Tokio.

126. Bronze bowl with cover, manufactured by Suzuki Kintaro, at Tokio.

M. Marunaka, Kanazawa, province of Kaga.

127. Vases manufactured by Yamagawa Koji, province of Kaga.

128. Vases, and small boxes, manufactured by Mizuno Genroku at Kanazawa, province of Kaga.

The Shippokuwasha, province of Owari.

129. Teacaddy manufactured by Miyaji, and vases, manufactured by Takenou-chi, at Shinoda province of Owari.

Kanaya Gorosaburo, Kiyoto.

130. Bronze vases and pots.

Yomo Yasunosuke, Kiyoto.

131. Bronze plates,

Class 454.—Miscellaneous Objects of Art.

S. Fukihara, Tokio.

132. Enamelled small plates and jar.

M. Marunaka, Kanazawa, province of Kaga.

133. Enamelled silver goblets, manufactured by Gen-o, at Kanazawa, province of Kaga.

Kanaya Gorosaburo, Kiyoto.

134. Waterpot, goblets and sweet meat boxes.

Ta. Ho-ji, Kiyoto.

135. Vase.

Namikawa Yasu u-ki, Kiyoto.

136. Vases, lunch boxes, cigar stands, and sajite cases.

H. Zoroku, Kiyoto.

137. Taiko (ornamental buckle), imitation of old bronze.

Kiriu-kosho-kuwai-sha, (*first Japanese manufacturing and trading co.*), Tokio.

138. Enamelled basin, imitation of Chinese ware, manufactured in the province of Owari.

139. Porcelain statuettes.

DEPARTMENT VI.—AGRICULTURE.

*Random checking gave no indication of
real samples from this collection in Nansei
ARBORICULTURE AND FOREST PRODUCTS. Wood
Collection*

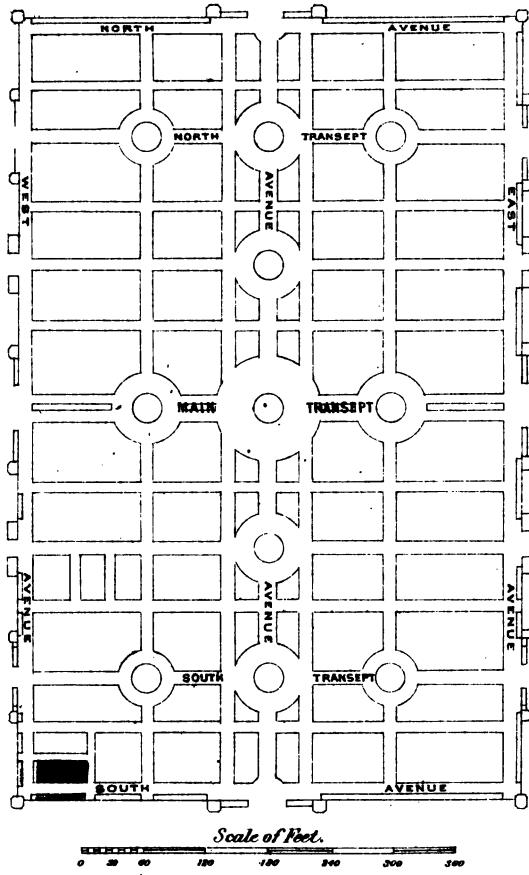
Class 600.—Trees in Sections.

Kuwangiyo-Riyo, (*imperial board of agriculture, industry and commerce*), Tokio.

- Specimens of Sugi (*Cryptomeria Japonica*), of three kinds, viz., Aka-sugi, Shiro-sugi and Kurobe-sugi, prepared by N. Senda, Tokio.
- Specimens of Sugi (*Cryptomeria Japonica*) prepared by I. Sugi-ura.
- Ichii (*Taxus cuspidata*), Hinoki (*Chamaecyparis obtusa*), Sawara (*Chamaecyparis pisifera*), Hiba (*Thujopsis dolabrata*), Nedzuko (*Thujopsis leatrevirens*), prepared by H. Kono.
- Wasbyakudan (*Thuya*), Benibyakushin (*Juniperus Japonica*), from Iwamai-ken.

- Various species of pine.—Aka-matsu, Kuro-matsu and Himeko-matsu, prepared by N. Senda, Tokio.
- Larch tree, prepared by H. Kono.
- Kaya (*Toreya nucifera*), Inugaya (*Cephalotaxus drupacea*) maki (*Podocarpus macrophylla*), prepared by N. Senda, Tokio.
- Tsuga (*Abies Thuga*), prepared by H. Kono.
- Momi (*Abies firma*) prepared by C. Yebiya.
- Tohi (*Abies allokotiana*), Shirabe (*Abies Veitchii*) prepared by H. Kono.
- Ichio (*Salisburia Adiantifolia*) prepared by I. Sugi-Ura.
- Walnut tree, prepared by N. Senda
- Sawa-kurumi (*Pterocarya sorbifolia*), prepared by H. Kono.

AGRICULTURAL BUILDING.
GROUND PLAN.



Scale of Feet.
0 30 60 90 120 150 180 210 240 270 300 330

SPACE ALLOTTED TO JAPAN, AGRICULTURE BUILDING.

Historical Instruments & Apparatus
of Agriculture, Mining & Manufacture

WEST AVENUE

Source.	SHOWERS	SHEDS	SHEDS
	Aromatic Liquors Wines.	Preserved Fruits.	Sugar Syrups.

SHEDS	SHEDS	SHEDS
Shells, Fish, Skins.	Dye Works.	Shells, Fish, Skins.

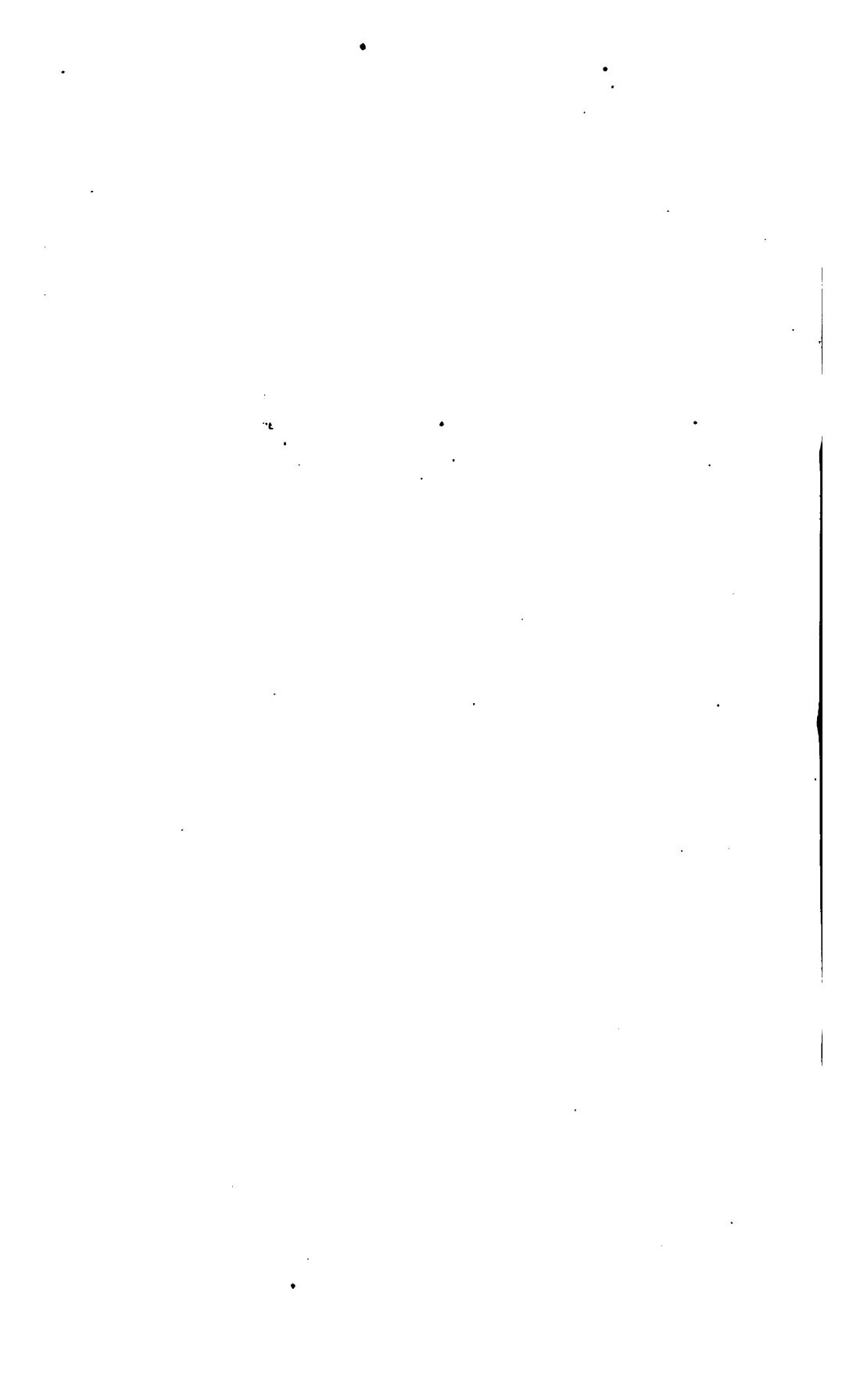
TEA		Tobacco	
Silk in Cocoons & reeled. Drawing, models & tools etc. of Silk worm breeding.			

SOUTH

AVENUE

Dried Fishes

Scale of Feet.
0 1 2 3 4 5 10 15



14. Evergreen oak, in two kinds prepared by N. Senda and C. Yebiya.

15. Ubamegashi (*Quercus Phylloides*) from Ashikara-ken.

16. Oak, Kashiwa (*Quercus dentata*), Nara (*Quercus crispula*) and chestnut tree, prepared by N. Senda.

17. Minebari (*Alnus firma*), alder, Midzume (*Betula ulmifolia*), Shirakanba (*Betula Alba*), prepared by H. Kono.

18. Kurokabe (*Rhamnaceae*).

19. Willow, prepared by I. Sugi-ura.

20. Beech, prepared by H. Kono.

21. Keyaki (*Planera Japonica*), mulberry trees, Mukuno-ki (*Celtis aspera*), Yenoki (*Celtis sinensis*), Harunire (*Ulmus campestris*), Yamagiri (*Elaeococca cordata*), prepared by N. Senda.

22. Box tree, prepared by K. Takano.

23. Inu-Tsuge (*Ilex crenata*), Mochinoki (*Ilex integra*), Honoki, (*Magnolia Hypoleuca*), prepared by N. Senda.

24. Katsura (*Cercidiphyllum Japonicum*), prepared by H. Kono.

25. Aogiri (*Firmiana platanifolia*), Kiri (*Paulownia Imperialis*), Kiwada (*Evodia glauca*), prepared by N. Senda.

26. Sansho (*Xanthoxylum piperitum*), prepared by H. Kono.

27. Lacquer tree, Nurude, (*Rhus Semialata*), Utsugi (*Deutzia scabra*), Kaki (*Diospyros Kaki*), prepared by N. Senda.

28. Cherry tree, plum tree, Sumomo, (kind of plum tree), pear tree, Kwarin (*Pyrus chinensis*), loquats, horse chestnut, prepared by N. Senda.

29. Mukurogi, (*Sapindus mukurosi*), Momiji, (*Acer Polymorphum*), Kusu (*Cinnamomum camphora*), Yenji (*Sophora Japonica*), Mokkoku (*Ternstroemia Japonica*), Tsu-baki (*Camellia Japonica*), prepared by N. Senda.

30. Shirakuchi (*Actinidia Arguta*), Kenponashi (*Hovenia dulcis*), prepared by H. Kono.

31. Toneriko (*Fraxinus Longicusis*), prepared by C. Yebiya.

32. Hiragi (*Olea Aquifolia*), prepared by N. Senda.

33. Chan-Chin, from Toyo-oka-ken.

34. Sendan (*Melia Japonica*), prepared by I. Sugi-ura.

35. Yego (*Styrax*), Aokiba (*Aucuba*), Saru-su-beri (*Lagerstroemia*), prepared by N. Senda.

36. Isu (*Distylium racemosum*), prepared by C. Yebiya.

37. Mayumi (*Evonymus Sieboldianus*), Nanten (*Nandina domestica*), Shu-ro (*Chamaerops excelsa*) prepared by N. Senda.

38. Yamamomo (*Myrica nageya*), from Ashikara-ken.

39. Soro (*Carpinus sp.*), prepared by C. Yebiya.

40. Aodako, Shio-ji (*Kalopanax Ricinifolia*), prepared by C. Yebiya.

41. Baramomi (*Abies sp.*), prepared by C. Yebiya.

42. Cinnamon, prepared by N. Senda.

43. Koyosan (*Cunninghamia sinensis*), Yamanashi, prepared by C. Yebiya.

44. Midzuki (*Cornus brachypoda*) prepared by N. Senda.

45. Shirotsuga, prepared by H. Kono.

46. Sogeki (*Myrsine nerifolia*), Nagi (*Podocarpus Nagi*), from Ashikara-ken.

47. Midsukusa, prepared by N. Senda.

48. Zumi (*Pyrus sp.*), prepared by H. Kono.

49. Kuromoji (*Lindera sericea*), prepared by Takaki.

50. Specimens of bamboo of various species.— Baskets, matting, hoops, ladles, brooms, ropes, lattice-work, and many other things, made of bamboo.

I. Matsu-o, Tokio.

51. Specimens of bamboo, bleached.

Class 602.—*Dye Woods and Saps.*

Kuwangyo-Riyo, (*imperial board of agriculture, industry and commerce*), Tokio.

52. Woods, barks, and galls, for dyeing.

52 b. Raw lacquer.—Resins and saps of the unripe persimmon.

POMOLOGY.

Class 610.—*Fruits.*

Kuwangiyo-Riyo, (*imperial board of agriculture, industry and commerce*), Tokio.

53. Preserved fruits.—Plum, peach, apple, pear, persimmon, jujubes, pomegranate, grape, orange, lemon, fig, etc.

AGRICULTURAL PRODUCTS.

Class 620.—*Cereals.*

Kuwangiyo-Riyo, (*imperial board of agriculture, industry and commerce*), Tokio.

54. Rice of two kinds, Italian millets, Hiye (a special kind of millet), sorghum, etc., collected by R. Fujiya.
 55. Barley, wheat, millet, Italian millet, buckwheat, etc., collected by S. Masuto.
 56. Indian corn, various kinds of.
 57. Kaitakushi, (*department for the colonization of the island of Yesso*).
 58. Wheat.

Class 621.—*Peas and Beans, etc.*

Kuwangiyo-Riyo, (*imperial board of agriculture, industry and commerce*), Tokio.

58. Soya, adzuki (*Phaseolus radiatus*), beans, peas, and other kinds of leguminous plants, collected by S. Matsudo.
 59. Soya, beans, French beans, etc., collected by R. Fujiya.
 60. Soya, peas, etc., collected by Riyogendo.

Class 623.—*Tobacco and Tea.*

Local Government of Shirakawa-ken.

61. Tobacco leaves, cut and uncut.

Local Government of Kagoshima-ken.

62. Tobacco leaves, cut and uncut.

Local Government of Shiga-ken.

63. Tobacco leaves, cut.

Municipality of Kiyoto, (*Kiyoto-fu*).

64. Tobacco leaves, cut and uncut.

Municipality of Osaka, (*Osaka-fu*).

65. Tobacco leaves, cut and uncut.

Local Government of Nagasaki-ken.

66. Cigars.
Local Government of Saga-ken.
 67. Tobacco.
 68. D. Noda, Kumamoto, province of Higo.
 69. Tobacco leaves and cigars.
 70. Kiriu-kosho-kuwaisha (*first Japanese manufacturing and trading company*), Tokio.
 71. Cigarettes.

Kuwangiyo-Riyo (*imperial board of agriculture, industry and commerce*), Tokio.

70. Samples of green and black tea and its adulterations.
 71. S. Suzuki, province of Hiuga.
 72. Samples of tea.
 73. Y. Kuroki, province of Hiuga.
 74. M. Otori, province of Hiuga.
 75. S. Sato, province of Hiuga.
 76. I. Womura, province of Hiuga.
 77. M. Watanabe, province of Hitachi.
 78. Samples of green tea.
 79. Y. Yebihara, province of Hitachi.
 80. Samples of green tea.
 81. J. Katakura, province of Hitachi.
 82. Samples of green tea.
 83. N. Kuroda, province of Higo.
 84. Samples of green tea.

N. Kamimura, province of Higo.
 80. Samples of green tea.
 S. Kaku, province of Higo.
 81. Samples of green tea.
 H. Fujita, province of Higo.
 82. Samples of green tea.
 C. Kobori, province of Higo.
 83. Samples of green tea.
 H. Hirano, province of Higo.
 84. Samples of black tea.
 K. Tanaka, province of Chikugo.
 85. Samples of black tea.
 S. Kawai, province of Omi.
 86. Samples of green tea.
 R. Maino, province of Omi.
 87. Samples of green tea.
 Y. Hayashi, province of Tosa.
 88. Samples of green tea.
 K. Morikawa, province of Yetchizen.
 89. Samples of green tea.
 G. Hori, province of Iwami.
 90. Samples of tea.
 G. Miura, province of Mino.
 91. Samples of tea.
 T. Miyazaki, province of Hizen.
 92. Samples of green tea.
 I. Sato, province of Yetchigo.
 93. Samples of green tea.

K. Yanagida, province of Yetchigo.
 94. Samples of black tea.
 K. Imai, province of Totomi.
 95. Samples of green tea.
 S. Fukukawa, province of Totomi.
 96. Samples of green tea.
 I. Ozaki, province of Suruga.
 97. Samples of green tea.
 Minobe Chiubeye, Kiyoto.
 98. Samples of green tea.
 Nagaya Buyemon, Kiyoto.
 99. Samples of tea.
 Asada Toyemon, Kiyoto.
 100. Samples of green tea.
 Kambayashi Sansho and Sanniu, Uji, province of Yamashiro.
 101. Samples of tea. Implements and apparatus used for the preparation.
 Kiriukosho-kuwaisha (*first Japanese manufacturing and trading company*), Tokio.
 102. Samples of tea.
 M. Marunaka, Kanazawa, province of Kaga.
 103. Samples of tea.

Class 624.—*Seeds.*

Kuwangiyo-Riyo (*imperial board of agriculture, industry and commerce*), Tokio.
 104. Rape seeds, poppy, sesamum.

MARINE ANIMALS, FISH CULTURE, AND APPARATUS.

Class 645.—*Shells.*

Kuwangiyo-Riyo (*imperial board of agriculture, industry and commerce*), Tokio.
 105. Shells for manufacturing purposes.—Hotategai and Awabikai.

Class 646.—*Fish Skins.*

Kuwangiyo-Riyo (*imperial board of agriculture, industry and commerce*), Tokio.

106. Shagreen, sturgeon, and other fish skins.

Class 647.—*Fishing.*

Kiriukosho-kuwaisha (*first Japanese manufacturing and trading company*), Tokio.
 107. Nets, baskets, hooks, rods, lines, and other apparatus used for fishing.
 Local Government of Nagasakiken.
 108. Fishing implement and apparatus.

ANIMAL AND VEGETABLE PRODUCTS.

Class 650.—Sea Weeds.

0. **Nagura**, Kiyoto.
109. Vegetable isinglass.

Class 652-53.—Furs, feathers, etc.

Kuwangiyo-Riyo (*imperial board of agriculture, industry and commerce*), Tokio.
110. Hides, furs, horns.
111. Feathers of crane and pheasant.

Class 655.

K. Kumagai, Kiyoto.
112. Vegetable incense.

Class 656.—Preserved Meat and Fruits.

Kaitaku-shi (*department for colonization of the island of Yesso*).
113. Preserved meat and preserved fish.
Kuwangiyo-Riyo (*imperial board of agriculture, industry and commerce*), Tokio.
114. Preserved fruits, prepared with sugar.

Class 657-58.—Flour and Starch, etc.

Kuwangiyo-Riyo (*imperial board of agriculture, industry and commerce*), Tokio.
115. Flour and starch made of rice, wheat, buckwheat, Katakuri (*Erythronium grandiflorum*), Warabi (*Pteris aquilina*), Kudzu (*Pueraria thunbergiana*), and other plants.

TEXTILE SUBSTANCES OF VEGETABLE OR ANIMAL ORIGIN.

Class 665.—Cotton.

Government cotton factory, Sakai, province of Setzu.
128. Cotton in raw state, and in all stages of preparation—seed, cotton in bolls, ginned opened, combed, lap, rove, threads, and hank, etc.

Class 659.

Kuwangiyo-Riyo (*imperial board of agriculture, industry and commerce*), Tokio.
116. Sugar, various kinds of.
City chemical laboratory, Kiyoto.
117. Sugar candy.

Class 660.—Wines and other drinks.

Kamazaki, Tokio.
118. Sake, various kinds of, sweet liquors, spirits and other alcoholic liquors.
H. Matsuya, Tokio.
119. Various kinds of sweet liquors, wines and malt liquors.

Z. Sawada, Tomo, province of Bingo.

120. Various kinds of sweet liquors.

S. Hashimoto, Tokio.

121. Spirits, sake and sweet liquors.
122. Soy (a kind of sauce).

Kitakaze Yu, Hiogo, province of Settsu.

123. Vinegars.

The City chemical laboratory, Kiyoto.

124. Mulberry wine, lemonade, punch and other drinks.

Z. Naga-oka, Tokio.

125. Soy and sweet liquors. Diagrams showing the process of soy brewing.

B. Mori and K. Ito, Tokio.

126. Soy.

Class 661.—Biscuits.

Nishi-wo Matsutaro, Kiyoto.
127. Yatsuhashiyaki (kind of cracknel).

Class 666.—Hemp, Ramie, etc.

T. Maru, province of Iwami.
129. Ramie, raw and prepared.
Z. Hattori, province of Iwami.
130. China grass, spooled.

T. Asaya, Tokio.

131. Hemp, ramie, jute and Irakusa (*Urtica Thunbergiana*), raw and prepared.

R. Takamura, province of Totomi.

132. Fibres of *Pueraria Thunbergiana*, raw and spooled.

Riu-kiu han (*Loochoo island*).

133. Fibres of *Musa-Basho*, and *china grass*, raw and prepared.

Class 668.—Cocoon and Silk.

Kuwangiyo-Riyo-no-yosankakari (*govern-*

ment establishment for experimental silk worm breeding), Tokio.

134. Silk in cocoons and reeled.—Drawings, models, descriptions, tools and apparatus showing in detail the various methods of the cultivation of mulberry trees and of silk worm breeding.

Y. Tamamura, Ishi-i-mura, province of Shimodzuke.

135. Silk reeled.

M. Marunako, Kanazawa, province of Kaga.

136. Silk reeled.

AGRICULTURAL ENGINEERING AND ADMINISTRATION.

Class 670-72.

Kuwangiyo-Riyo (*imperial board of agri-*

culture, industry and commerce), Tokio.

137. Plows, seythes, harrows and grain cradles.

DEPARTMENT VII.—HORTICULTURE.

ORNAMENTAL TREES, SHRUBS AND FLOWERS.

(The objects appertaining to this department are arranged in the space around the Japanese Bazar, so as to represent a Japanese garden.

Class 700.—Evergreen Trees and Shrubs

Kuwangiyo-Riyo, (*imperial board of agriculture, industry and commerce*).

1. Various species of pine.
2. Chabo-Hiba (*Chamaecyparis Obtusa* var.), Hiyoku-Hiba, (*Chamaecyparis pisifera* var.).
3. Ibuki (*Juniperus Japonica*).
4. Koyamatsu (*Sciadopitys verticillata*).
5. Maki (*Podocarpus macrophylla*).
6. Nagi (*Podocarpus nageia*).
7. Species of Sugi (*Cryptomeria Japonica*).
8. Species of Hi-no-ki (*Chamaecyparis obtusa*).
9. Yudzurira (*Daphniphyllum roxburghii*).
10. Kaya (*Torreya nucifera*).
11. Tarayo (*Ilex latifolia*).
12. Moji-no-ki (*Ilex integra*).
13. Saka-ki (*Cleyera Japonica*).
14. Tea plants.
15. Hiragi (*Olea aquifolia*).
16. Masaki (*Evonymus Japonica*).
17. Yatzude (*Fatia Japonica*).
18. Sotetsu (*Cycas revolutus*).
19. Several kinds of bamboo.
20. Shuro-Chiku (*Rhamnus flabelliformis*), various species of.
21. Mokkoku (*Ternstroemia Japonica*).
22. Tobera (*Pittosporum tobira*).
23. Mokusei (*Olea fragrans*).
24. Zuiko (*Daphne odorata*).
25. Aokiba (*Aucuba Japonica*).
26. Kinkan (*Citrus Japonica*).

27. Orange trees, various kinds of.	43. Oyama-Renge (<i>Magnolia pariflora</i>).
28. Tsubaki and Saranka (<i>Camelia Japonica</i> and <i>Sasanqua</i>).	44. Kaki (<i>Diospyros kaki</i>).
29. Mube (<i>Stauntonia hexaphylla</i>).	45. Fuji (<i>Wisteria chinensis</i>).
30. Binan-Kadzura (<i>Kadsura Japonica</i>).	46. Ajisai (<i>Hydrangea ajisai</i>).
31. Nanten (<i>Nandina domestica</i>), two species of.	47. Momiji (<i>Acer sp.</i>).
32. Hiraginanten (<i>Berberis Japonica</i>).	48. Mansaku (<i>Hamamelis Japonica</i>).
33. Shiromoji (<i>Lindera triloba</i>).	49. Ro-bai (<i>Chimonanthus fragrans</i>).
34. Shuro (<i>Chamaerops excelsa</i>).	50. Mume (<i>Prunus mume</i>).
35. Teikakadzura (<i>Parechites Thunbergii</i>).	51. Nishiki-gi (<i>Evonymus alatus</i>).
	52. Tsuru-mume-modoki (<i>Celastrus articulata</i>).

Class 701.—Herbaceous Perennial Plants.

36. Hana-shobu (*Iris tectorum*).
 37. Shaku-yaku (*Paeonia officinalis*).
 38. Kuzu (*Pueraria Thunbergiana*).

Class 702.—Bulbous and Tuberous Plants.

39. Various kinds of lily.

Class 703.—Ornamental Follage.

40. Kiri (*Paulownia Imperialis*).
 41. Aogiri (*Firmiana Platanifolia*).
 42. Mokuran (*Talauma Sieboldii*).

Class 707.—Ferns.

53. Ferns.
 54. Shinobu (*Davallia sp.*).
 55. Zenmai (*Osmunda regalis*).

Class 708.

56. Hasu (*Nelumbo nucifera Gaertu*).

Class 722.—Ornamental Wire Work.

57. Fences, gates, etc., made of bamboo.

Class 733.—Garden Construction.

58. Garden, laid out by C. Miyagi.

TABULAR STATEMENT OF MINES AND CHIEF SEATS OF INDUSTRY IN JAPAN.

LOCAL GOVERNMENT	PROVINCES GOVERNED	MINES	POTTERY & POTTERY	BRONZES	LACQUERED WARE	RAW SILK	TEXTILE FABRIC	TEA & TOBACCO	PAPER	MANUFACTURED ARTICLES.
1 <i>Tokio-Fu</i>	<i>Musashi</i>		<i>Tokio</i>	<i>Tokio</i>	<i>Tokio</i>		<i>Tokio</i> (Cotton)		<i>Tokio</i>	Trunks Fancy articles
2 <i>Kyoto-Fu</i>	<i>Yamashiro & Tamba</i>	<i>Kiyomida Amida Fushimi</i>	<i>Kyoto</i>	<i>Kyoto</i>			<i>Nishijin</i> silk fabrics	<i>Uji</i> / <i>Yamamoto</i> Namban-Beza	<i>Kyoto</i>	<i>Kyoto</i> & Fushimi Sands
3 <i>Osaka-Fu</i>	<i>Settsu</i>					<i>Osaka</i>		<i>Osaka</i>		
4 <i>Kanagawa</i>	<i>Sagami & Musashi</i>			<i>Yokohama</i>						Admiralty Bamboo Ware
5 <i>Hiogo</i>	<i>Settsu</i>									
6 <i>Magnsitu</i>	<i>Eigen, Iki Tosa</i>	<i>Takahashina</i> (Coal, Minerals, oil)	<i>Wikanji</i>							
7 <i>Niigata</i>	<i>Techno</i>	<i>Nakashio</i> (Coal, & Minerals, oil)					<i>Wakayama</i> (Cotton)			
8 <i>Saitama</i>	<i>Musashi</i>									<i>Chiba</i> & Tobacco
9 <i>Kumagai</i>	<i>Musashi & Kochi</i>									
10 <i>Ashikaga</i>	<i>Sagami & Tosa</i>									
11 <i>Chiba</i>	<i>Musashi, Naga-</i> <i>Yamashiro & Tamba</i>						<i>Yokohama</i> (Cotton)			
12 <i>Ibaraki</i>	<i>Hizen & Shimane</i>	<i>Sugiyama</i> (a Mineral oil)								<i>Chiba</i> & Tobacco
13 <i>Tojigi</i>	<i>Shimotsuke & Kosuke</i>						<i>Whole Province</i>	<i>Kyoto</i> (Silk fabrics)		
14 <i>Nara</i>	<i>Yamato</i>							<i>Arima</i> (cotton)		<i>Nara</i> (Fam)
15 <i>Sakai</i>	<i>Izumi & Komei</i>							<i>Sakai</i> (cotton & cotton)		
16 <i>Miye</i>	<i>Ise & Iga</i>									
17 <i>Watarai</i>	<i>Ise, Shima & Kii</i>									
18 <i>Aichi</i>	<i>Owari & Migara</i>	<i>Sedo</i> (Cobalt, Ores of cobalt, clay)	<i>Sedo</i>	<i>Nagoya</i>						<i>Nagoya</i> (Bam)
19 <i>Kanematsu</i>	<i>Totomi</i>	<i>Habikarayama</i> (Mineral oil)		<i>Shitara</i>						
20 <i>Shidzu-oka</i>	<i>Suruga</i>									
21 <i>Tomonashi</i>	<i>Kai</i>						<i>Whole Province</i>	<i>Yokohama</i> (Silk fabrics)	<i>Yokohama</i>	<i>Orkney -</i> / Island in West of Japan
22 <i>Shiga</i>	<i>Omni</i>		<i>Shiguraku</i>				<i>Whole Province</i>	<i>Yokohama</i> (Silk fabrics)	<i>Yokohama</i>	<i>Orkney -</i> / Island in West of Japan
23 <i>Gi-fu</i>	<i>Mino</i>	<i>Akasaka</i> / <i>Mario</i>	<i>Togi</i>				<i>Whole Province</i>	<i>Susaka</i>		
24 <i>Chikuma</i>	<i>Shigeno & Mita</i>						<i>Whole Province</i>			
25 <i>Nagano</i>	<i>Shinano</i>	<i>Mitayu-uchi-Kori</i> (Mineral oil)					<i>Whole Province</i>			
26 <i>Miyagi</i>	<i>Rikusen & Fukushiro</i>	<i>Wotsunibana</i> (Plumage)					<i>Whole Province</i>	<i>Shirishi</i> (Silk fabrics)		
27 <i>Fukushima</i>	<i>Yamashiro & Izumi</i>	<i>Hando</i> (Silver)					<i>Whole Province</i>			
28 <i>Iwanai</i>	<i>Iwaki</i>	<i>Chioka</i> (Iron)					<i>Whole Province</i>			
29 <i>Wakamatsu</i>	<i>Yamashiro & Izumi</i>	<i>Aitsu</i> (Rock salt)					<i>Whole Province</i>			
30 <i>Iwai</i>	<i>Rikuchiu & Rikuchiu</i>	<i>Hosokura</i> (Ind.)								
31 <i>Iwade</i>	<i>Rikuchiu</i>	<i>Kasato</i> (Copper, Ind.) <i>Kasato</i> (Copper, Ind.) <i>Kasato</i> (Copper, Ind.)					<i>Whole Province</i>			
32 <i>Awamori</i>	<i>Mukyu</i>	<i>Urasuwa</i> (Silver)								
33 <i>Yamagata</i>	<i>Uzen</i>									
34 <i>Oituma</i>	<i>Uzen</i>									
35 <i>Kurugakko</i>	<i>Uzen & Ugo</i>									
36 <i>Akita</i>	<i>Igo & Rikuchiu</i>	<i>Imai</i> (Silver, Ind.) <i>Imai</i> (Copper, Ind.) <i>Imai</i> (Copper, Ind.)					<i>Nashiro</i>			
37 <i>Tsuruya</i>	<i>Yotsuken & Wakasa</i>						<i>Tsuruya</i> (Oboro)	<i>Tsuruya</i> (Suk), <i>Iwao</i>	<i>Iwao</i>	<i>Kyoto</i> (Cotton)
38 <i>Ishikawa</i>	<i>Kaga & Noto</i>	<i>Kutani</i>	<i>Kanazawa</i>	<i>Washima</i> (Por. of Noto)						<i>Kyoto</i> (Cotton)
39 <i>Niikawa</i>	<i>Yechiu</i>			<i>Toku-ichi</i>						
40 <i>Aikawa</i>	<i>Sudo</i>	<i>Aikawa</i> (Gold & Silver)		<i>Aikawa</i>						
41 <i>Toyo-oka</i>	<i>Kajima, Tomo & Sugao</i>	<i>Itaino</i> (Gold & Silver)						<i>Minoyama</i> (Silk fabrics)		<i>Chitose</i> (Cotton)
42 <i>Tottori</i>	<i>Imai, Tomi & Oka</i>									<i>Mitsue</i> (Cotton)
43 <i>Shimane</i>	<i>Idsu-mo</i>	<i>Utoe</i> (Copper)								
44 <i>Hamada</i>	<i>Iwami</i>	<i>Ginsanmachi</i> (Silver)								
45 <i>Shikama</i>	<i>Harima</i>							<i>Himeji</i> (Cotton)		<i>Himeji</i> (Linen)
46 <i>Hokujio</i>	<i>Nimasaka</i>									
47 <i>Okayama</i>	<i>Bingo, Bishau & Bingo</i>	<i>Yodoh-oka</i> , <i>Yodoh-oka</i> , Copper	<i>Yodoh-mura</i>							
48 <i>Hiroshima</i>	<i>Aki & Bingo</i>	<i>Miyoshi</i> (Copper, Ind.) <i>Bingo</i> (Iron)								
49 <i>Yamaguchi</i>	<i>Syogo & Yagoto</i>	<i>Ruka-gori</i> (Ind.)	<i>Hagi</i>							
50 <i>Wakayama</i>	<i>Kii</i>	<i>Ind. rocks</i>					<i>Kuroi</i>			
51 <i>Mioto</i>	<i>Awa & Awaji</i>			<i>Iwanomura</i> (Awaji)						
52 <i>Kagawa</i>	<i>Sanuki</i>									
53 <i>Yehime</i>	<i>Iyo</i>									
54 <i>Kochi</i>	<i>Tosa</i>									
55 <i>Fukuoka</i>	<i>Chikusen</i>		<i>Takatori</i>					<i>Hakata</i>		
56 <i>Mitsuma</i>	<i>Chikugo</i>	<i>Mi-ike</i> , Coal								
57 <i>Kokura</i>	<i>Bizen</i>									
58 <i>Oita</i>	<i>Bungo</i>	<i>Ohira</i> (Ind.)								
59 <i>Saga</i>	<i>Hizen</i>	<i>Kurashiro</i> (Coal) <i>Arita</i> (Porcelain clay)	<i>Arita</i> & <i>Kurashiro</i>					<i>Ureshino</i> (Cotton)		
60 <i>Kumamoto</i>	<i>Higo</i>	<i>Amakusa</i> (Coal)	<i>Yatsushiro</i>					<i>Aso</i> (Ind.)		
61 <i>Miyazaki</i>	<i>Hiuga</i>									
62 <i>Kagoshima</i>	<i>Sakurajima & Osumi</i>	<i>Tanigawa</i> (Ind.)	<i>Narashiki-</i> <i>roregawa</i>					<i>Kagoshima</i> (Cotton)	<i>Kagoshima</i>	
63 <i>Kagoshima</i>	<i>Kagoshima</i>	<i>Kagoshima</i> (Ind.)								

The Products of the Island of Iesso are not enumerated here.

DESCRIPTIVE NOTES
ON THE
Manufacturing and Agricultural Industries
OF
JAPAN.

THE Commissioners, when engaged in classifying the goods destined for the Philadelphia Exhibition, determined to have the catalogue accompanied by a few explanatory notes on the history, origin and manufacture of the objects to be exhibited, feeling sure that the foreign purchasers of the catalogue would greatly appreciate this information.

In consequence of this decision the following account has been compiled, and notwithstanding that it has no pretensions as a scientific treatise, it will, nevertheless, be found to contain a certain amount of reliable information of especial interest to those who find time to visit the Japanese section. The compiler of these notes has attempted to describe as clearly as it is possible, without the help of diagrams, the technical processes by which the various articles are produced; and care has also been taken to designate the nature of the different raw materials used in the manufacturing and agricultural industries. Many of these have not as yet been sufficiently examined in a strictly scientific sense, and it is to be hoped that their exhibition may attract the attention of competent persons.

A few remarks on the history and social conditions of industry and agriculture, will probably not be found out of place, and whenever it has appeared necessary to illustrate the actual conditions of Japan by statistical information, the latter has been obtained as much as possible from authentic sources. The Commission will be pleased to feel, that in compiling these notes, additional material has been furnished for the more complete knowledge of the national manufacturing and agricultural industries, and that they may perhaps contribute to a further extension of the commercial relations of Japan with other countries.

DEPARTMENT I.

MINING AND METALLURGY.

Very little is known about the origin of mining in Japan. It is, however, a fact, that several mines were being worked during the latter part of the eighth century (Japanese period Dai-Do); and the large number of old abandoned adits, which are to be found in the metalliferous districts leave no doubt as to the fact, that mining was in a flourishing condition centuries ago.

The system of working mines has changed but little since olden times, and consists simply in driving one or several adits from places where a vein or seam appears on the slope or top of a hill; the vein is followed as far as possible, and when necessary, lower adits are driven until in the end it is found impossible any longer to overpower the water with the very imperfect machinery used for pumping and draining. Many mines have had to be abandoned after a longer or shorter period of prosperity, solely on this account.

In certain instances great efforts have been made to avoid this misfortune, and adits have been driven for the purpose of draining off the water. Thus in the lead mines of Hosokura, in the province of Rikusen, a draining adit may be seen of 8370 feet in length; nevertheless the mine has been almost entirely abandoned, as the actual working places are at present far below the level of the water adit in question. In the copper mines of Udoje, where the rock is very soft, a water adit 13 feet high and 10 feet wide was commenced a few years ago.

Ever since the earliest times the timbering of the adits has been known and effected with all the necessary skill; and as the wood is both abundant and cheap in most places, it has not been spared. The dimensions of the adits vary greatly; in some mines they are so narrow that it is almost impossible for a full-grown person to pass through, and consequently children have to effect the transport of the mineral. The latter is usually packed in strong sacks, made of matting, which are fastened to the child's back by means of a rope. In many places the passage becomes so low that the child has to crawl along on "all fours," dragging the sack of mineral behind him. The ladders used for getting from one adit to another on a different level, are simply trunks of trees with steps cut into them.

The means employed by the miner for attacking the rock consist merely in the use of hand tools, viz., the pick, the gad, the hammer and chisel. Gunpowder has only been brought into use for blasting purposes in later years, and its introduction is chiefly due to foreigners.

The apparatus used for removing the water is composed only of small wooden hand-pumps, buckets, and occasionally of a kind of water-wheel with scooping paddles, and moved by treading; the water pipes are either made of bamboo or wood.

As regards the ventilation of the mines, it is often realized with more or less of perfection, by connecting two adits of different levels, and in some cases by running an air channel, made of wooden planks, throughout the whole length of the adit, so as to allow the air to circulate through the adit and this channel. In the lowest adits, however, the absence of sufficient ventilation has in many cases caused them to be abandoned or else to be worked on a very small scale only.

The lighting in the mines is either effected by torches of dried bamboo or oak wood, which latter is beaten until it becomes soft enough to burn easily; or by iron lamps in the shape of saucers with a double suspension—sometimes the lamps consist merely of a kind of murex shell containing vegetable or fish oil. The wick is made of the pith of the soft rush (*Juncus effusus*) which is also used for wax candles and ordinary lamps.

The annual production of the mines of Japan was estimated in 1875 at the following figures:

	Quantity.		Value in dollars, Mex.
Gold,	376 Kilos.	.	250,000
Silver,	9,740 "	.	390,000
Copper,	3,000 tons Engl.	.	900,000
Iron,	5,000 "	.	150,000
Lead,	185 "	.	21,275
Tin,	7.5 "	.	8,000
Coal,	390,000 "	.	1,950,000
Coal oil, 1,035,000 litres.	.	.	23,000
	Total,		3,687,275

Of late years the government has made great efforts to improve the condition of mining and metallurgy, the principal shortcomings of which are:

1. The insufficiency of machinery for pumping out the water.
2. The imperfect system of attacking the rock with only hand-tools, which, together with the custom of leaving the mine to be worked entirely by contracting miners, without any system, and under no control, has not only the effect of causing a great part of the vein to be left untouched; but also in many cases the future of the mine has been endangered by the total absence of any well combined plan.
3. The imperfection, and consequently the expensiveness, of the processes employed for dressing, preparing and smelting the ores. Some mines, however

such as the Takashima coal mines near Nagasaki, are now being worked according to the modern system and are provided with the necessary steam power.

The working of several other mines is being improved in the same manner, and the new works are already in course of erection at the silver and copper mines in Ikuno, Sado, and Ugo. The government mining department has also commenced the construction of several high furnaces for the smelting of iron ores.

MINERALS, ORES, BUILDING-STONES, ETC.

CLASS 100—MINERALS, ORES, ETC.

The veins of gold and silver ore in Japan are generally composed of quartz, native silver, silver ore (argentite and antimonial silver), containing more or less gold, iron and copper pyrites, occasionally mingled with blende and galena.

In the mine at Handa, province of Iwashiro, the silver lode appears in a micaceous shist which has been broken through by granite. This mine, which was formerly of great importance, had to be abandoned in consequence of the difficulty experienced in draining off the water—a fate which also befell the Unosawa mines, in the province of Mutsu, where the rock of the hill which encloses the veins is feldspathic porphyry and conglomerate, overlaid by volcanic sand.

The immediate neighborhood of these mines is especially remarkable for the numerous sulphur springs, the water of which is very cold and contains a large amount of sulphuretted hydrogen; and in addition to the difficulties experienced in getting rid of the water, the presence of noxious gases and the absence of proper ventilation offered further inducement for the abandonment of the mine; the large number of adits and underground workings, however, tend to show that it has been of great importance.

The working of the Ginsanmachi mines in the province of Iwami, which are reported to have yielded enormous quantities of silver two centuries ago, was interrupted by violent earthquakes in 1872, which caused some of the newer adits to cave in. Among the most important mines which are being worked at the present time, are those of Innai in the province of Ugo, those of Ikuno in the province of Tashima, those of the Island of Sado on the west coast of Nippon, and those of Kosaka in the province of Rikuchiu. In the Innai mines mentioned above, the rock containing the silver vein is felsite covered by a lava stream; the vein, mostly four to five feet wide, sometimes attains a width of thirty feet, and occasionally branches out in numerous smaller veins of about six inches each. The vein substance is very hard, and is composed of silver ore (argentite and antimonial silver), copper pyrites, blende, quartz and calcite.

This mine, which has been in operation over two hundred and fifty years, and which actually gives employment to some 1730 persons, is now being worked at a depth of 750 feet below the level of the lowest water adit; the quantity of dressed ore annually obtained amounts to 105,000 kilogrammes, containing on an average 1·534 per cent. of silver, 0·014 per cent. of gold, and valued at 65,000 dollars.

The Ikuno mines, at one time probably the richest in Japan, were opened some three hundred years ago, and at the beginning of this century gave employment to some 4000 miners. But as the workings got deeper and the rock harder, and since the ore contained far less metal than that found in the upper part of the mines, and consequently was more difficult to smelt, the number of miners decreased rapidly, until in 1869 only 500 were employed. But of late years the working of the mine has been again put in active operation, and it is to be hoped that with the aid of all the improvements of modern science, the old prosperity will shortly return to it again. In 1874 the ore obtained from the mines amounted to about 3226 tons, but as the new works are not completed, only $62\frac{1}{2}$ tons were treated, which yielded gold to the amount of 2928 dollars, and silver to the amount of 1647 dollars.

In Sado, where two great veins run from north to south, separating into a number of smaller branches which alone have been worked until now, a large number of abandoned adits can be found, and it is stated that this mine was opened more than 1000 years ago. Actually only six are in working condition, following veins from 3' to 20' wide. The mineral contains gold, silver, copper, lead, and in some places antimony. The new plan is to sink three shafts, two for hoisting the ore, and one for pumping and hoisting combined. One of these shafts is to have a depth of 668 feet, and 4 galleries will be driven at a depth of 368', 468', 568' and 668', and of more than 2000 feet in length. Another of the shafts will have a depth of 902', with 3 galleries of 2500' in length. The whole of the work is expected to be completed in 12 years from now. It has been estimated that the probable quantity of ore to be obtained from these mines within the next 12 years will amount to 300,000 tons, and that after that an annual amount of over 60,000 tons will be obtained from these same adits during the space of 3 years. At present the whole of the ore is not smelted, as the smelting works are not yet entirely completed. In 1873 not less than 6000 tons of ore remained from former years without being smelted, and 1867 tons had been mined during that year; but of this large amount only 1217 tons were treated, producing 18 kilo., 422 of gold, and 763 kilo., 573 of silver. At Ikuno the circumstances are very similar, since the amalgamation and smelting works are only in course of construction. In 1874 the ore mined amounted to 3236 tons, of which only 64 tons were smelted, yielding 4 kilo., 384 of gold, and 39 kilo., 468 of silver. In Kosaka 3497 tons of ore produced 5 kilo., 3558 of gold, and 703 kilo., 606 of silver. In some parts of Japan gold-dust is found in the

banks of certain rivers, and is washed by a very simple process. The bed of the river having been regulated wherever the banks contain gold, the auriferous material is brought down from the banks into the river and washed by the stream; the concentrated gravel is received on small mats, which the workmen place into the stream and move in such a way as to have the lighter particles rapidly carried away by the stream, while the gold and part of the gravel settle upon the mat. The final washing is done on small wooden trays.

IRON ORES.—The most important and almost the only ore worked till now, is the magnetite, found either in the shape of solid masses or in that of sand. The deposits of this ore are especially abundant in the province of Rikuchiu, where the rock containing the ore is either felsite of a granitic character, or diorite with garnets and hornblende. At Heigori, in Rikuchiu, these deposits can be traced for several miles in length, and no boundaries have been ascertained as to their width and depth. Some of the working places are 1000 feet above the level of the valley. Similar deposits, equally extensive and in decomposed granite over-laid by a thin stratum of talcose clay-slate, appear on the tops of several hills in the province of Iwaki. In general the magnetic ores contain from 62 to 65 per cent. of metal. The magnetic sand and the solid ore are the only materials used for smelting iron; however, iron glance and brown haematite, with 56 to 60 per cent. of iron ore, are also found in Japan.

COPPER ORE is found in many places, and may be considered as a rich ore, since it contains on an average from 10 to 15 per cent. of metal. It is composed mostly of copper pyrites, together with more or less iron pyrites, and is found chiefly in clay-slate. The principal mines are situated in the northern part of the island of Nippon, but ores are also found in more southern provinces, as for instance in Bichiu. Sometimes the ores are much richer than has been stated, and contain 25 to 35 per cent., even up to 55 per cent. of copper. This is the case, for instance, with the richest ores found in the mines of Ozarisawa, province of Rikuchiu. The total bulk of the ore obtained from this mine averages more than 12 per cent. of metal. In 1873, 2716 tons were smelted, and yielded 346 tons of copper, *i. e.*, nearly 13 per cent. The richest ore of this mine is the bornite, and contains 55.6 per cent. of copper; next come the ordinary copper pyrites, with 34.5 per cent. of metal. In some places, as for instance, in the Ani mines, the ores contain enough silver to render the extraction of this metal by the ordinary liquation process profitable. These mines are remarkable in the fact that the vein is evidently not the primary bed of the ore, but that it has been shifted, and that the broken ores are now imbedded in a soft clay, which renders it easy to separate them from the vein substance.

THE LEAD ORES which are found in Japan are mostly galenas, with 40 to 80 per cent. of metal, and sometimes a small quantity of silver. They are frequently associated with blende, also copper and iron pyrites.

TIN ORE is found in Satsuma, Suwo, and Bingo.

In later years, attention has been drawn to other minerals, such as gray antimony, and bioxide of Manganese; but they are, as yet, without great importance.

A cobaltiferous mineral, which is found in the shape of small pebble-conglomerates in the bed of certain rivulets, has been known for many years. After the raw material has undergone a certain process of powdering, washing, and calcining, it is used for blue porcelain paintings.

CLASS 101.—COAL, ASPHALT, PETROLEUM.

MINERAL COMBUSTIBLES are found in numerous places, and have been worked in small quantities for many years, the applications being limited to the saltworks, lime kilns, here and there to the blacksmith furnace. The most important coal fields are those in the north-west of the Island of Kiushiu, in the district of Karatsu; and also in the Island of Takashima, near Nagasaki. When the American steamers commenced running between China and Japan, they generally provided themselves at Nagasaki with Karatsu coal. This combustible is found in a sand stone formation, repeatedly broken through by granitic dykes. The seams appearing on the side of the hills, are at the most 5' thick, and are composed of alternating layers of coal and bind, the thickness of the former varying from a few inches to 20 inches in the best places. The total yield of the Karatsu district may be estimated at 80 to 90 tons daily, which is sold at the neighboring ports at 4 to 5 dollars per ton.

The development of steam navigation soon demanded a larger supply of fuel; and the working of the rich seams in the Island of Takashima, about eight miles west of Nagasaki, was then commenced on the modern system, with improved machinery. This mine, actually the property of a Japanese company, is now very prosperous, and produced 78,000 tons in 1874. The seams, with a dip of some 20 degrees from south to north, are 13 in number, varying from 3' to 10' in thickness, but only 5 of them yield a good quality of coal. The work was commenced in 1868, by the sinking of a shaft in the northern part of the island down to the second seam, which was 8 feet thick, and has been worked out last year. A second shaft, more to the south, has been sunk to the lowest strata, where two good seams of 8 and 10 feet, respectively, are found laying above one another, with very little space between them. Moreover, a little below, half way down, the shaft traverses another seam, 5 feet thick, also composed of good coal. All the machinery has been carried over to this shaft, and the actual daily production amounts to 650 tons. There is now a working population of 1500 miners, 350 laborers, and 200 carpenters, blacksmiths, mechanics, etc. An underground tramway, and a second one above ground, from the mine to the wharf, transport the coal first to the shaft and then to the coal junks, which are thereupon towed down to Nagasaki. The produce is composed of 60 per cent. of small coal, quite

good enough for steamers, and sold at \$4.50, and 40 per cent. of lump coal, bringing \$6 to \$7.50 per ton, at Nagasaki. The coal is of a very good kind, containing only 5 to 7 per cent. of ashes, excellent for making coke, on account of its caking quality, and fit for any industrial purpose.

In the Island of Amakusa, on the west side of Kiushiu, a sort of coal is found, which is very much like anthracite. The coal found in Kii and Owari is of a similar kind. That in the more northern part of Japan is chiefly brown coal and lignites. In the province of Rikuchiu, it is found in the Molasse.

As the industry of the country is being developed by the introduction of new methods and machinery, so will the demand for mineral combustibles increase, and mining will be effected on a much more extensive scale. As for the national system of working the mines, it is usually done by driving parallel levels along the face of the coal, about 10 feet distant, weakening the pillars left between them as much as possible, and taking them away, when the end of the seam has been reached. Takashima is the only place where shafting of any importance has been effected.

PETROLEUM is found in the districts to the north-west of Tekio, as, for instance, in Yechigo, Shinano, Ugo, etc. In the first of these provinces oil was discovered 300 years ago; and it has always been counted amongst the seven wonders of Yechigo, that a natural combustible gas issuing from the ground in certain places, could be brought through bamboo pipes, into the interior of the houses and used for illuminating purposes, as it is now used for heating the small stills for refining the crude oil. Although the presence of the oil has been known for a long time, the people of the country only began to use it 46 years ago. Since then, no less than 508 wells have been sunk in the district, some of them 400 and even 600 feet deep. The daily produce from these wells amounts to 3420 litres, of the two kinds of oil—one of a light color, spec. weight 0.800, and containing 8 per cent. of light oil, 52 per cent. of lamp oil, 28 per cent. of heavy oil, and 12 per cent. of residue; the other one dark, spec. weight 0.930, with only 9 per cent. of lamp oil, 58½ per cent. of heavy oil, and 32½ per cent. of residue. The better quality of oil is burnt in primitive lamps, whereas the darker oil is partly used to make torches for the fishermen. Some years ago a company was formed for establishing refineries, but it did not succeed; another one has since been formed, and is likely to turn to advantage these natural resources of the country. In Shinano the daily produce of 39 wells amounts to 1600 litres, the greatest part of which has a dark color and a spec. weight of 0.935, with only 13 per cent. of lamp oil. It is said that after the earthquake, which happened 29 years ago, the oil springs were considerably modified in their conditions of locality as well as of quantity.

Some years ago mineral oil was also found in the province of Totomi.

CLASS 102.—BUILDING STONES, ETC.

Although building stones are by no means scarce, yet they have been seldom used for houses, but mostly for foundations, temple-stairs, gateways, sea-walls, and battlements, which latter are sometimes of enormous extent ; as for instance in Tokio and Osaka where some granite stones of 30 feet in length, by 18 feet, can be seen. The battlements and walls are generally made of well dressed blocks of irregular shape, and built up without the use of mortar. The chief materials used for these different purposes are granite, trachyte, and trachyte-tuff. The grave-yards and temple gardens also contain a great number of stone monuments, and lanterns of the same material adorn the approaches of the temples. The first specimen of stone cutter's workmanship is said to have been the coffin of the Emperor Koan, who reigned during not less than 102 years, from 392 to 291, B.D. The use of stones for the foundation of houses only commenced 4 to 5 centuries, A.D., whereas before this time the houses were built upon wooden piles driven into the ground. It is asserted that the frequency of earthquakes was not the reason for making wooden constructions, but that it was in consequence of the wood being cheap and abundant, and besides more easy to work and to transport, that preference was given to this building material. There is now in Tokio a whole quarter of the town where the houses are built of brick, and stone warehouses can be seen at all the open ports in great number.

Marbles of different colors are found in several provinces, chiefly in Mino and Hitachi, and are used for ornamental works of small size.

CLASS 103.—LIME, CEMENT, ETC

Stone buildings being somewhat scarce in the country, and the sea-walls or battlements having been built without mortar, the use of lime or cement has been limited to the roofs and the plastering of walls. Shell lime is mostly used, but stone lime is also made in several places. Puddled clay is used for lining water tanks and ponds, but it appears that in certain parts of the country materials are to be found which can perfectly well be used for hydraulic mortar, without being first calcined. Two years ago two kilns were constructed in Tokio, under the supervision of the Board of Public Works, for making artificial cement from a mixture of clay and chalk ; the manufactured produce is sold in considerable quantities, mostly to government works. All kinds of colored mixtures of sand, clay, and lime and mineral colors are prepared for plastering the inner walls of the houses, and a very fine black stucco is used for the exterior of the fire-proof warehouses. In order to give the plaster more solidity and coherence, paper fibres (prepared by boiling old paper) and the gluish decoction of a fucus, called Fu, are mingled with the powder.

CLASS 104.—CLAY, KAOLIN, SILEX, ETC.

Minerals used for pottery of all kinds, such as clay, kaolin, silex, etc., are very abundant in Japan, and are spread all over the country. In many instances very good ordinary refractory materials and fine porcelain clay are found close together. This is the case to a most remarkable degree in the neighborhood of the small town of Arita, province of Hizen, the head centre of the porcelain manufacture in Japan. Within a very limited circuit, not half a mile in diameter, there are found imbedded in the rock at different places, all the materials necessary for the biscuit, for the coating of the ware before glazing, for the glaze, for the "craquelé," etc., the best being of such good quality, that after being powdered and decanted, it is used without any further mixture for the finest ware, the so-called egg-shell porcelain. In the central part of Nippon, where granite is the principal constituent of the mountains, in the provinces of Owari, Yamashiro, and the island of Awajishima, opposite Hiogo, beds of petuntse, very much like the Bohemian material, are to be found. When used for porcelain, this material is mixed with siliceous and feldspathic minerals from other places. A thorough mineralogical and chemical examination of these minerals has not yet been made, but would, no doubt, prove to be of great interest.

CLASS 105.

Graphite has been discovered in Satsuma and Rikuzen ; certain very pure samples have been found fit for such purposes as the manufacture of pencils ; but in this case it would have to be washed and ground with an addition of clay.

CLASS 106.

Whetstones, grindstones of all qualities, are very abundant, and are in the hands of every artisan, who, on account of the softness of his cutting tools, is frequently obliged to have recourse to the whetstone. Garnets are used for grinding and polishing hard materials.

CLASS 107.—MINERAL WATERS, ETC.

Many hot springs are found in Japan, and have been used by sick people since olden times ; mineral waters are also abundant, but have not been sufficiently examined as yet.

Natural brines have only been discovered in one place, province of Iwashiro (formerly Aidzu), and are not of any importance. Saltpetrical efflorescences are found in Satsuma. Mineral fertilizing substances, such as marls, are frequently used by the farmers.

METALLURGICAL PRODUCTS.**CLASS 110.—PRECIOUS METALS.**

The dressing of the auriferous ore was formerly done by hand, the ore being first broken and sorted by women, then classified and carried to the smelting works. Here it was pulverized with iron hammers on inclined stone tablets, then sifted, decanted, partly ground upon hand mills, washed upon sleeping tables, and vanned in wooden trays. The particles of gold were melted in small crucibles by means of an open charcoal fire, with the help of hand box-bellows.

As regards silver, the processes of liquation and cupellation were the same as those generally used in other countries. The separation of gold and silver was done by the old method of melting the alloy with sulphur.

In the new silver smelting works now in course of construction at Ikuno, and in the island of Sado, the amalgamation process is already introduced to a certain extent, whereas in Kosaka, the ores are to be smelted by Ziervogel's method. At the same time, particularly at Sado, part of the ore has been treated by liquation, and this process seems to be more economical.

CLASS 111.—IRON AND STEEL.

The smelting of iron by the old method, is effected in small furnaces of rectangular section, built on the principle of the "Stückofen," 12 to 15 feet high. The building materials are fire-clay, and for the hearth a mixture of fire clay and charcoal powder. The blast is produced either by means of a pair of wooden box-bellows, moved by hand, or else by means of a sort of balance-bellows of peculiar construction. Suppose a horizontal cylinder cut by two planes passing through the axis, and forming between them an angle of about 30° ; two opposite sectors will be cut out. A rectangular plane, equal to the axial section, and balancing upon the axis of the primary cylinder, would fit the sides of the box in each position, and, when made to balance alternately from one side to the other, would act like the piston of a common box-bellows. According to this geometrical principle, the box of the bellows is composed of two cylindrical sectors, and the balancing plane is made of wooden boards, resting by its middle line upon a beam, which forms the central edge of the two sectors (or the axis of the aforesaid imaginary cylinder). The compressed air from each side is discharged into a short channel cut at an incline of 45 degrees into this beam, in the centre of which they unite into a main outward passage for the blast. At the place where these two oblique channels meet to form the main pipe, a flap-valve is placed, which, being put into motion by the compressed air, closes alternately, either of the two short channels whenever the opposite half of the balance-piston moves down. Two flap-valves, fitted each to one side of the piston, allow the outer air

to enter one or the other half of the bellows. The balancing motion of the piston is produced by treading, two or three men standing on each end of this blasting machinery.

The magnetic ore is first calcined in large lumps and afterwards broken into smaller pieces with hand-hammers, then smelted with or without flux.

The furnaces for smelting the iron-sand are of a peculiar construction. The ground is dug out so as to form a pit 12 feet by 15, and 10 feet deep, and this is filled up to a depth of 9 feet with hard powdered charcoal; then comes a layer of clay and sand, which is dried and hardened by covering it with charcoal fire. The ashes being taken away, the pit is filled up with charcoal-powder, and the surface coated with a fire-proof mixture. Upon this foundation the furnace is built, 9 feet by 4' feet at the basis, and 4 feet high. The interior resembles to a great extent the well-known Rachette furnace, forming a wedge-like hollow space, with a horizontal section of 6' in length, and having a line of tweers (5 with the above dimension) on each of the long sides. When the smelting begins, the furnace is entirely filled up with charcoal, the box-bellows are put to work, and 12 hours later, as the whole mass sinks down, iron-sand and charcoal are filled in. The smelting lasts 2 days and 3 nights. Generally 3750 kilos of iron-sand are smelted with an equal weight of charcoal, and yield 45 per cent. of pig iron and 1 per cent. of steel in loops or blooms. When the above-named quantity has been smelted, the liquid iron is run off, and as soon as the furnace is cool enough, the steel loops hanging against the walls are broken off. The whole process lasts about 8 days, viz., 2 days for building the furnace, 3 days for smelting and 3 days for coating, for removing the steel, etc., and for cleaning the place in order to be able to build a new furnace.

Some gentlemen, especially Mr. Oshima, the actual chief of the mining department, have exerted themselves to introduce improvements, and with the sole assistance of some foreign books have succeeded in building a certain number of blast furnaces 27' high, for smelting magnetic ore in the province of Rikuchiu. These furnaces are lined with fire-bricks made on the spot, and the blast is produced through square blowing boxes moved by overshot water-wheels. Each furnace smelts about 3750 to 4500 kilos. of ore per diem, yielding 50 per cent. of pig iron, and consuming 6000 kilos. of charcoal; no flux is used. The conversion of pig into wrought iron is effected in small fineries, by charges of 3 kilos. of pig iron producing two bars of 1 kilo, 125 each, for which 7 kilos. 5 of charcoal are used. The iron is sold at the neighboring port at the rate of 67 kilos, 5 to 73 kilos of pig iron and 15 to 20 kilos of bar iron for one yen or Japanese dollar.

It is now intended (and the work has already been commenced under the direction of foreign engineers) to establish large smelting works composed of 4 blast furnaces calculated to produce each 15 to 20 tons daily, of 12 puddling furnaces, rolling mills, steam hammers, coke ovens, etc., in the province of Rikuchiu, the estimate for the whole being 820,000 dollars. In two of the furnaces charcoal will be used.

CLASS 112.—COPPER IN INGOTS, ETC.

Japanese copper was first discovered during the reign of the Emperor Tenmu, 684 A.D. His successor, the Emperor Gemmiyo, ordered the coining of small silver money to be stopped, and had copper coins made instead, bearing the four characters Wa-Do, Kai-Chin, which means "Japanese copper, newly discovered precious thing." In connection with this the period of 7 years from 706 to 712, received the name of "Wa-Do," or "Japanese copper."

The smelting of the ore is effected on principles similar to those in Europe, but with a very simple apparatus. The ore is sorted when necessary, powdered and washed by hand, the stone and dust-ore are calcined together in small kilns fired by wood, the whole operation lasting 30 days in all. It is afterwards smelted with charcoal in a kind of hearth resembling the German "gahrheerd," consisting merely of a depression in the ground, $1\frac{1}{2}$ feet in diameter, and lined with a mixture of clay and charcoal. A clay chimney carries off the smoke and fumes, and two slightly inclined and clay enveloped tweers protrude through the back wall. Each furnace, as for instance those of Ozarisawa, smelts in 14 hours 2250 kilos of ore, using 656 kilos of charcoal, and producing 300 kilos of regulus with 75 per cent. of copper, and 95 to 112 kilos. of coarse copper. The regulus is roasted and converted into coarse copper in similar but smaller furnaces. The smelting is effected with great skill, so that the slag always contains less than 1 per cent. of copper. At other places, as for instance in Bichiu, the ore is smelted to a black copper regulus of 90 or 95 per cent. of metal, without repeated roasting or any other operation. Such copper as contains precious metals is smelted with lead and treated by liquation; the resulting argentiferous lead is subjected to the process of cupellation in small "treibheerds" of only 1 foot in diameter, and consisting of a depression in the ground lined with wood ashes and covered with a clay dome. As the concentration of the silver in the lead before cupellation is not practiced, the entire lead used for liquation has to be cupelled, and the litharge is then reduced again in furnaces similar to those for smelting copper ore.

The refining furnaces are similar to the above mentioned smelting furnaces, only somewhat smaller, and sometimes the copper is smelted in small crucibles containing 30 to 35 kilos. The process used is the same as in other countries, namely, the foreign metals are oxidized, and, finally, the copper is passed through the operation of poling. The refined metal is generally poured out in basins of hot water, at the bottom of which is the mould for the bars. The latter is a sort of wooden grate lined with thick cloth, and the spaces between the bars form the mould for the copper bars. This grate is covered by hot water to a height of 6 to 8 inches, and the pouring out of the liquid metal has to be skilfully done in a thin and continuous stream from the crucible. The process of refining is often performed in special places, where the copper, in the shape of cakes or "rondelles," is purchased from the smelting works.

CLASS 113—LEAD, ZINC, ETC.

Lead ore is first powdered by hydraulic or hand power, thereupon sifted, and then washed by hand in wooden pans, so as to produce a schlich of 75 to 80 per cent. of lead. This is then smelted in a small furnace similar to those used in refining copper, and constructed by digging a hole in the ground and lining it with a mixture of clay and charcoal; pig iron is added in order to precipitate the lead.

The blende which often accompanies the galena is not used, and in many places is to be found in considerable quantities on the dump heaps.

The spelter used for the brass and bronze alloys is all imported.

CLASS 114.—ALLOYS USED AS MATERIALS.

The Japanese alloys are mostly used for ornamental castings, statues, musical instruments, and bells. The name given to an alloy generally corresponds to the color produced by the treatment which the objects have to undergo before they are finished; thus some of the alloys are named green copper, violet copper, black copper, etc. This color depends both upon the composition of the alloy and the chemicals used in coloring the metal. There are many different means used to produce one and the same color, and it so happens that almost every manufacturer uses particular compositions of his own; generally it is only the proportions that differ, but sometimes even the constituent elements are different, although the alloy is called by the same name.

The "green copper" (Sei-Do) is composed of copper and lead, or copper, lead and tin; the Sentoku-do of copper, lead, and spelter; and similar to the old Corinthian alloy, is said to have been first produced by a large conflagration which took place in China during the earlier part of the 15th century. The black alloy called U-do, of copper, lead, and tin; the brass, of copper and spelter, sometimes with a slight addition of lead, as, for instance, in Yechiu, one of the chief places of production of ornamental castings inlaid with gold and silver; the purple alloy is composed of copper and lead; the so-called Gin-shibu-ichi is generally composed of 4 parts of copper or alloy and 6 parts of silver. Another peculiar composition is the Shakudo, copper with a small percentage (2 to 5 per cent.) of gold, which produces a beautiful dark blue color, and is mostly used for articles formed by hammering, or for repoussé work, generally inlaid with gold and silver, and producing designs somewhat similar to the so-called "Niello" work.

D E P A R T M E N T I I.

MANUFACTURES.

Japanese manufactures are of great interest to foreigners, primarily in consequence of the raw material (often unknown in other countries) of which they are made, and secondly on account of the various processes used in their production, processes invented in the long course of patient manual labor, which left to each artisan a free field for his exertions to simplify his work or to produce some new and original object. Although in most cases, the origin of the Japanese industries can be traced back to China or Corea, they have been so much modified in every respect, that almost all traces of this origin have disappeared, and that the creations of Japanese artisans show in the highest degree a particular character of their own. Several centuries of peace (since 1600) have powerfully contributed to the development of the various industries, especially such as are connected with art, and which were greatly encouraged by all those who had the power of doing so. The finest monuments of Japanese art in Kiyoto, Tokio, Nikko, and other places, date from this period, as do also the best specimens of the so-called curios, which are admired in the celebrated art collections in Europe, and also much sought after by collectors on account of their exquisite workmanship.

Of later years foreign influence, and the demand of market have greatly modified the old traditions of art, and it is not to be wondered at, if during this period of transformation some mistakes are made, and Japanese artists sometimes go a little astray, since they are not always directed, as they should be, by those who give them orders to supply the demand of the foreign market. But the participation of Japan in the great international exhibitions encourages the hope that the people will not only obtain a better knowledge of the general principles of art, but that they will also learn to appreciate more highly the native artistic element, which has now taken so prominent a place in the creations of European art industries; and that guided by such experience and knowledge, the artisans will be enabled to perceive the right way to such improvements and modifications as will preserve them from making any very serious mistake. The government has already directed its attention to this most important subject, and since the Vienna exhibition, has commenced the creation of a museum in Tokio, shortly to be followed by the organization of drawing and science schools, etc., etc.

Until now there has been no institution, where specimens of fine art were collected together for public inspection, and where good old traditions of art were preserved and communicated to a certain number of pupils. The Japanese artisan is still very much like those of mediæval Europe, working in his own,

peculiar way, assisted only by a very few assistants, and being himself both artist and artisan. This of course has had the fortunate effect of preserving to the industrial productions their striking features of originality. However, in order to develop more extensively the art industries, it will be necessary to bring about a more complete division of labor between the artist's genius and the artisan's skill. With the Philadelphia exhibition in view, some attempts have been made to this effect; and several of the most remarkable pieces of porcelain, bronze castings, wood carvings, etc., exhibited, have been first designed by an artist, and the drawings thereupon sent to the manufacturing places to be executed according to the design.

With reference to the social condition of industry, it should be stated that there are but very few workshops of any size or importance, giving employment to more than thirty or forty persons, and that in most places the manufacturing is done on a small scale. Heavy machinery, with the exception of water wheels, is not used; but the hand tools are in general very well adapted for their purposes; and in several branches of industry such as, for instance, in fan making, in the manufacturing of porcelain, etc., the division of labor is carried out to a large extent. Of later years not only the government, but also the private people have made great efforts to create larger industrial establishments. Several paper mills have been erected in Tokio, Kiyoto, and Osaka; cotton mills, silk reeling establishments, with steam or water power, are to be found in different places; a glass furnace has been built in Tokio; sulphuric acid works in Osaka; soap manufactories are at work in Tokio and other places. The streets of Yokohama, and of a great part of Tokio, are lighted by gas made of the coal mined in Miike, province of Chikuzen; several machine shops and gun manufactories have been established by the government in Tokio, Osaka, Nagasaki, and the arsenal of Yokoska is very completely organized for the purpose of ship building. At the same time, more liberty has been conceded to trade in general, and the old restrictions have been abolished without producing any of those perturbations which have so frequently taken place in Europe in consequence of reforms effected in connection with the social condition of industry. Indeed, there has never been anything like an industrial legislation in Japan, or anything similar to the strict organizations, sanctioned by law, of the old trade corporations in Europe. Everybody was allowed to learn whatever trade he liked, and the apprenticeship terminated as soon as ever the master considered the apprentice sufficiently far advanced to release him from his obligations, when it was usual to send him off with a document in some form or other, stating that the bearer had been his pupil. Every master made it a point of honor to instruct only such apprentices as were likely to do him credit; and even to this present day the good artists and artisans are primarily known as being the pupils of such and such a famous master, until they in their turn attain fame. The origin of the former trade restrictions had but little to do with the artisans themselves, but was rather owing

to a desire to secure for certain provinces or districts the monopoly of some particular industry, the raw material for which was only to be found in that part of the country, or the conditions of which were exceptional to these provinces. Thus, for instance, in the province of Hizen it was prohibited to export any of the materials used for porcelain making; certain kinds of porcelain were not allowed to be manufactured without special permission of the local government. Other trade restrictions were more intimately connected with the regulations concerning the distinction of the various classes of the people; until shortly, only the nobles were allowed to wear silk. All this has been done away with under the present government; every man is now allowed to settle wherever he pleases, and to undertake whatever industry he likes. With these conditions it is to be hoped that the progress of the country will be rapid and continuous.

It remains yet to be added, that the government has from ancient times been in the habit of instituting special boards with a view of promoting and developing newly introduced industries, as for instance in the case of pottery, in the art of weaving, and making silk garments, etc., etc. This practice has been observed until this day; but this duty of promoting industry has now been committed to one central board, which, whilst forming one of the divisions of the Ministry of the Interior, has also had charge of the preparations for the Philadelphia Exhibition.

To these remarks of a general character, we now add some special notes concerning the various industries of the country, limiting our observations either to some characteristic features of a technical kind, or else only pointing out the peculiar nature of the raw materials used in the manufacture of the articles exhibited.

CLASS 200.—CHEMICALS.

Technical chemistry is only in its infancy, and limited to a few pharmaceutic products, and such articles as copper and iron sulphates, alum, saltpetre, etc., easily produced by the processes of oxidation and lixiviation. A first step towards chemical industry has been made, by the erection of sulphuric acid works in Osaka, which will soon be completed with soda furnaces. A great number of young Japanese are ardently pursuing the study of chemistry, and preparing themselves for the practical application of this science.

As to alkalies, wood-ash and the lyes produced from it, are used in the various industries, such as dyeing, paper making, etc.

Salt is used in large quantities for the ordinary food, and the preservation of fish and vegetables. It is exclusively produced from sea water by solar evaporation in large salt gardens, composed of a series of fields, the soil of which has been hardened and afterwards covered with a layer of sand. The clean sea water flowing in through a perfect net work of small ditches, is sprinkled over the fields by the workmen, the operation being repeated three times at intervals of a

few hours. The sand is then raked together and carried for lixiviation to the filters, which consist of small square mud tanks, 4' by 4', having a double bottom of bamboo, covered with straw and mattings. The concentrated lye running out from these filters is first stored in covered wells, and then brought to the evaporating pans through wooden pipes. These pans are not always of the same construction. In some places, they consist of low vaults, built of large pieces of slate, covered with gravel and mud, so as to fill up the interstices, and to form the bottom of the pan, which is surrounded by a low mud wall. This vault has an opening on one side for the insertion of fuel, and another one on the other side leading into the flue.

In other places, a very curious kind of a pan is used, which is constructed in the following manner: A low wall is built, enclosing a space of 13' by 9', the bottom forming a kind of prismatical depression, 3' deep in the central line. An ash-pit, 3 feet deep, is then excavated, starting from the front wall, and extending about 4' into this depression at its deepest place; it communicates with the outside by means of a channel, sloping gradually upwards, and passing underneath the front wall. The ash-pit is covered by a clay vault, with holes in its sides, so as to establish a communication between the ash-pit and the hollow space under the pan. This vault is used as a grate, the fuel (brown coal and small wood) being inserted through a door in the front wall. The air draught necessary for burning the fuel, enters partly by the fire door, partly through the ash-pit, and the openings left in the vaulted grate. Through these same openings, the ashes and cinders are from time to time pushed down into the ash-pit, for which purpose small openings are left in the side wall of the furnace, through which the rakes may be introduced. A passage in the back wall supporting the pan, leads off the results of combustion and the hot air into a flue gradually sloping upwards, and ending in a short vertical chimney. At the lower part, some iron kettles are placed in the flue for the purpose of heating the lye before it is ladled into the evaporating pans. With reference to the pan, it is made in a way which requires a great deal of skill and practice. In the first place, beams reaching from one side to the other, are laid upon the top of the furnace walls, and are covered with wooden boards, forming a temporary floor. Two or three feet above this floor, a strong horizontal net work of wooden poles sustain a number of straw ropes, with iron hooks hanging down, and of such length, that the hooks nearly touch the wooden floor. The floor is thereupon covered with a mixture of clay and small stones, 4 to 5 inches thick, the workmen being careful to incrustate the iron hooks into this material. It is allowed to dry gradually, and when considered sufficiently hardened, the wooden beams and flooring are removed with the necessary precautions. The bottom of the pan remains suspended by the ropes. The open spaces left all around, between the bottom and the top of the furnace walls, are then filled up, and the border of the pan, 9-10" high, is made of a similar mixture. It is said that this extraordinary construction lasts 40 to 50

days when well made, and that it can be filled 16 times in 24 hours, with an average of 500 litres of concentrated lye at each filling. But the quantity depends upon the weather, and is less in winter than in summer. During the cold season one pan yields 140 litres each time that it is filled, and in the hot season from 190 to 210 litres; the average consumption of coal in 24 hours is stated to amount to 1500 kilos. The salt, when removed from the pan, is placed in baskets, so as to allow the adhering lye, and part of the deliquescent impurities to drip off; afterwards it is spread out with a layer of sand underneath, in order to dry. The purity of the salt, which differs in quality, depends upon this last treatment. Thus, the product of the principal salt gardens of Japan, those of Saita, province of Awa, in the Island of Shikoku, is considered as excellent for salting fish, etc., whereas, the salt of Ako, in Harima, is preferred for cooking purposes. The salt gardens of Awa were established 275 years ago, and now form a district of 12 villages, with a yearly produce of nearly 223,000 hectolitres of salt. It is said that during the period from March till the end of October, a surface of 4500 tsubos (14,876 square metres) of salt yields about 2700 hectolitres. Twelve or fifteen years ago, 18 hectolitres were sold for one dollar; but now-a-days, when all the necessities of life have largely increased in price, only $3\frac{1}{2}$ to $5\frac{1}{2}$ hectolitres can be bought for one dollar. The production of salt is by no means a Government monopoly; local taxes are merely imposed on given surfaces. In Awa these taxes lately amounted to 5270 dollars, for a surface producing 223,000 hectolitres. The total production of salt in Japan may be estimated at 5,700,000 hectolitres. The salt is sold by measurement, and not by weight.

CLASS 201.—OILS, SOAPS, &c.

The native oils used for illuminating purposes, are chiefly rape seed and fish oil. During the last few years, foreign petroleum and oil lamps have been largely imported, and are now to be met with even far away in the interior, and at great distances from the open ports. In the provinces, where mineral oil is found, the local population use it to a small extent, and have been trying their best to refine it with a very primitive apparatus. The latter consists merely of an iron kettle, serving as a still, covered with a wooden head, the top of which is formed by a reversed cone of sheet metal. The cone being filled with cold water, the vapor condenses against the cooled surface, and the liquid drips down from the vertex into a bamboo pipe, which, passing through the side of the wooden head, leads the condensed liquid outside.

The oil ordinarily used in Japanese households, is the rape seed oil, produced from the seed by heating, crushing, and finally pressing them with a kind of roughly made wedge press; in short, it is prepared by a series of operations similar in principle to the European processes. The lamps are merely flat saucers, and the wicks consist of two or three pieces of the white and soft pith of

the "Juncus effusus," which are laid into the saucer, and lighted by the end projecting above the edge of the vessel.

But the most important article for illuminating purposes, is the candle made of vegetable wax, which is mostly composed of palmitine. It is produced from the fruit of several trees belonging to the genus "Rhus," amongst which the "Rhus succedanea" is the most important, and is grown amongst vegetables, more or less extensively almost everywhere in Japan, especially in the western provinces, from the south northwards to the 35th degree. The lacquer tree, "Rhus vernicifera," also yields wax, and differs in appearance but little from the wax tree; its geographical limit extends further northwards, being at the 38th degree. Finally the "Rhus sylvestris," or wild wax tree, should be mentioned. The cultivated wax tree was originally imported from the Loo-choo islands; but the growers of the tree now distinguish seven different varieties. The berries, of the size of a small pea, and united in bunches, contain the wax between the kernel and the outer skin; they are crushed, winnowed, steamed, placed in hemp cloth bags, steamed again, and afterwards pressed in a wooden wedge press, all by hand. In order to facilitate the flow of the wax, a small percentage of "Ye no abura" (oil from *Perilla ocimoides*) is added. The raw product of a greenish color, is made into square cakes, and reduced to small scraps by means of a kind of planing tool, then washed and bleached by the sun and air, whereupon it assumes a pure white color. In ordinary candle-making the unbleached wax is used, and the manufacturing is done by repeated dipping and rolling on the flat of the hand, in order to smooth and harden the successive coatings. The wicks are made by rolling a narrow strip of Japanese paper in a spiral line around the upper part of a pointed stick, and twisting it at the upper end, so as to prevent its getting loose. Two or three strings of the pith of "Juncus effusus" are then rolled around this paper, in close spiral lines, and fastened with a few fibres of silk waste, so that the wicks can be taken off from the stick, and sold in bundles to the candle-maker. The latter places the wicks again on sticks, takes half a dozen of them in his right hand, dips the wicks into the melted wax, and rolls them upon the palm of the left hand, repeating these operations till the candles have grown to the proper size. For the outside coating, occasionally white wax is used. These candles are made of all dimensions; for ceremonies and similar occasions candles of bleached wax are used, of a fanciful shape and painted with bright colors. The art of candle-making is said to have been introduced from Loo Choo, towards the end of the 16th century. Before this time pieces of resinous wood or paper dipped in oil were used.

Another tree yielding a kind of vegetable tallow is the "Cinnamomum pedunculatum." This, however, is seldom cultivated, as, in consequence of its being an evergreen plant, it would cast too much shadow on the other plants cultivated underneath.

Beeswax is produced in different parts of Japan, chiefly in the western half of the island of Nippon, where bees are elevated in wooden boxes, generally larger than European bee-hives.

Another insect, producing a kind of wax, very much like or perhaps identical with the Chinese "pela," lives upon the "Ligustrum Iбота." The insects in clustering round the thin branches, form by their secretions, lumps of a slightly transparent white wax of a crystalline construction, and a very high melting point. This produce is of little industrial importance, not being abundant.

With reference to oils prepared for special purposes, and for food, the most important are the "Goma-no-abura," from "Sesamum orientale," and the "Ye-no-abura," from "Perilla ocimoides," belonging to the family of the Labiatae. The former is used principally for cooking; whilst the latter, chiefly on account of its drying qualities, is used either alone or with other pigments, for painting, coating, or varnishing. Its applications are numerous, and most important, such as, for instance, for umbrellas, water-proof cloth and coats, made of paper, for paper imitations of leather, for mixing with lacquer, and for many other purposes.

A very fine oil is extracted from the seeds of a certain species of "Camelia," and either flavored or unflavored is used for the hair or for pomades, which consist of a mixture of camelia-oil and vegetable wax.

CLASS 202.—PAINTS, PIGMENTS, VARNISHES, ETC.

The most interesting product appertaining to this class is undoubtedly the Japanese lacquer (urushi), celebrated all over the world for its excellent quality and great beauty. This valuable article is almost entirely a product of nature, and requires but a few mechanical operations to be ready for use. It consists merely of the sap of the "Rhus vernicifera," which is cultivated especially for the production of lacquer, chiefly between the 33° and 37° of N. latitude. The trees when 5 years old are regularly tapped, from the end of May until the end of October, incisions being made in the bark extending about one quarter of the trunk's circumference, and just deep enough to reach the wood. On the incision being made, clear sap flows out, mingled with a very white milky substance, which darkens very soon when exposed to the air, and gradually assumes a dark brown, and almost black color. At first these incisions are made at about 36 centimetres distance one from another, on alternate sides of the trunk, and the lacquer is taken off with an iron spatula as soon as it has filled the incisions. After an interval of three or four days new incisions are made, close above and below the former cuttings. Proceeding in this manner until the end of the season, the whole tree becomes covered with incisions, and has to be cut down. The branches are lopped off, soaked in water, and also tapped, by means of incisions

made in a spiral line. The lacquer taken from the branches becomes very hard, and is therefore mostly used for priming ; its name is "Seshime-urushi." In the more northerly part of Japan, where the lacquer tree is cultivated with the additional view of producing wax, the tapping is done on a small scale only, so that the tree need not be cut down, but may yield lacquer and wax for a number of years.

The quality of the crude lacquer (ki-no-urushi) depends upon the season in which it has been tapped, and also on the circumstances of climate and soil, as well as on the care bestowed upon the cultivation of the tree. The raw produce is a viscous liquid of a dirty gray color, always covered with a dark brown skin, where it comes into contact with the air, and mixed with particles of the bark of the tree and other accidental impurities. Having been placed in small wooden tubs, lined with paper, it is allowed to settle gradually ; the produce separates into a thinner and finer quality in the upper half, and a thicker and less good quality which settles in the lower half of the tub. Both are separated by decanting, and are strained through cotton cloth. The superior quality of lacquer is stirred in the open air in order to allow a certain excess of water to evaporate, after which process it assumes a brilliant dark brown and nearly black color ; in thin layers it appears transparent, with a brown color, similar to that of shellac. The further operations which the lacquer undergoes before being ready for use, are generally effected by the workman himself before using it ; they consist of mixing it with powdered substances, with a view of either hardening or coloring it, and of straining the pure lacquer, or the mixture, through a peculiar long-fibred paper called "Yashino-gami," made for this purpose. The Shunkei Urushi, a kind of lacquer which has to undergo no grinding or polishing, and which is supposed to acquire sufficient brilliancy by mere hardening, is made by mixing the pure lacquer with a small quantity of the "Ye-no-abura" mentioned above. This lacquer is used in a manner similar to the foreign shellac or copal varnishes for furniture, upon which it forms a brilliant transparent coating of a yellowish tint through which the veins of the wood remain visible.

A most interesting operation is that, by which the celebrated black lacquer (Roiro-urushi) is produced. This is effected without the addition of any solid particles, such as lampblack or similar substances, but merely by stirring the crude lacquer for one or two days in the open air, whereupon it assumes a very dark brown color. Towards the end of the operation, a small quantity of water, which has been allowed to stand for a few days mingled with iron filings, or a gall nut infusion darkened by the addition of iron, is added, and the whole stirred again until part of the water has evaporated, whereupon the lacquer acquires a proper consistence and color. The addition of this water is said to be absolutely necessary for producing the highest brilliancy and darkness of the lacquer. The operation as described above is indispensable ; but there are a few unimportant modifications, since the manufacturers sometimes add a solution of gamboge or a

decoction of the yellow fruits of "Gardenia florida," or other liquid dyestuffs for the purpose of improving or modifying the color of the varnish.

Amongst the peculiar properties of lacquer, it may be mentioned that it is rather poisonous, and often produces eruptions on the skin, or swollen faces, or headaches, etc.; however, the effects are not the same upon all persons; most people get accustomed to it; others are not affected at all by it.

As to the manipulations of coating and painting with lacquer, we refer the reader to class 217, and to the special pamphlet which has been published for the exhibition by order of the department of public instruction.

Japanese writing inks are very much like Chinese, and manufactured in a similar, though perhaps not quite identical way. The body of the ink is soot, obtained from pinewood or rosin, and lampblack from sesamum oil for the finest sort. This is mixed with liquid glue made of oxskin. This operation is effected in a large round copper bowl, formed by two spherical calottes, placed one inch apart, so that the space between can be filled up with hot water to prevent the glue from hardening during the time it is mixed by hand with the lampblack. The cakes are formed in wooden moulds, and dried between paper and ashes. Camphor, or a peculiar mixture of scents, which comes from China, and a small quantity of carthamine (the red coloring substance of safflower), are added to the best kinds, for improving the color as well as for scenting the ink. There is a great difference both in price as well as in quality of the various kinds of ink, the finest article being rather costly. The most renowned manufactory is in Nara, the old capital of Japan, in the province of Yamato.

CERAMICS—POTTERY, PORCELAIN, ETC.

CLASS 206—213.

Old Japanese legends attribute the invention of pottery to Oosei-tsumi, who lived in the time of Oanamuchi-no-mikoto, long before the historical period of Japan (*i. e.*, before the year 660 B.D.), and who was afterward honored with the divine appellation of "Kami." During the reign of the Emperor Jinmu (660—581 B.D.), whose residence was in Kashiwara, in the province of Yamato, one of his officials, named Wakanetsu Hiko-no-mikoto, received his commands to manufacture various kinds of pottery to be used in the temples for religious festivals. In the time of the Emperor Suinin (29 B.D.), human figures were formed of clay to be buried together with the deceased members of the imperial family, and in this manner to replace the servants who were otherwise obliged to accompany their masters into the grave.

Towards the end of the 6th century, a Corean tile manufacturer came to the capital to teach his profession, and under the Emperor Saimei (655—667

A.D.) an experiment was made to tile the roof of the temple belonging to the imperial residence, which was formerly thatched like all other buildings. In the beginning of the same century, during the reign of the Empress Suiko (593—628 A.D.), the pagoda of the temple of Koriuji, province of Yamato, was built of bricks.

In 724 A.D., a priest named Giyoki invented, or, what is more probable, introduced the potter's wheel; and samples of earthenware made at that time are still extant in the temple of Todaiji, province of Yamato.

All the earthenware mentioned above consisted merely of very common pottery, but after the introduction of the potter's wheel the emperor considered this industry as important enough to appoint a special official entrusted with the supervision and encouragement of this trade.

Fresh progress was made when, in the time of the Emperor Go-Horikawa (1223—1233 A.D.), a man named Kato Shirozayemon went to China, and after having seen some of the Chinese potteries, returned and settled in the province of Owari, at Seto, which is now an important centre of porcelain industry. However, the pottery which he made at that time was not porcelain, but a kind of stoneware.

A new article, now called "Raku," was introduced in the beginning of the 16th century by a Corean named Ameya, who came to the old capital of Kiyoto, where his descendants in the 11th generation are still pursuing the same trade. This "Raku," which is but a common black earthenware with a glaze containing lead, is only made in small pieces, each of which is baked separately. The principal articles made in olden times were the tea bowls used for the peculiar tea parties called "Cha-no-yu" (see Class 623). The latter were organized and provided with an elaborate system of ceremonial rules by order of the Shiogun Taikosama (Hide-yoshi), who honored the manufacturer of these raku bowls with a golden seal, on which the character "raku," meaning something like "enjoyment," was engraved.

The most important progress which was realized in ceramic art, was the beginning of the making of real porcelain, under the direction of Gorodayu Shonsui, a native of Ise, who went to China for the purpose of studying this branch of trade. After his return, between 1580 and 1590 A.D., he settled in the province of Hizen, at present the most important centre of the porcelain industry. With the excellent material found in this country, he succeeded in making all the different kinds of porcelain which even to-day form the staple produce of Hizen, viz., Some-tsuki, or blue ware painted with cobalt oxide under the glaze; the Kanyu or Hibiki, *i. e.*, the "craquelé"; the Seidji, or seladon ware; the Akai, or the red ware; and the "Gosai," which name means, in reality, the "five colors," and was used for the porcelain painted with vitrifiable colors upon the glaze; this ware is now called "Nishikide." The old Hizen, or, as it is sometimes called, the Imari porcelain, chiefly manufactured in

Arita, is decorated with a very limited number of colors, blue under the glaze, black for the outlines of the ornamentation, then red, green and gold. For a short time after the introduction of this new industry, the articles were generally marked with the name of the above mentioned Shonsui, indicating that it was ware made in accordance to the style taught by him. About this same time, after the Corean war (1592), several Corean porcelain makers were brought over to Hizen by the Prince Nabeshima Naoshige, and contributed greatly to the development of the new industry. There are yet many descendants of these Coreans living in Arita, but they have entirely amalgamated themselves with the Japanese. In more recent times porcelain making was commenced in other provinces, where the proper clay is to be found, such as, for instance, in the provinces of Kaga, Owari, Mino, in Kiyoto, and some other places of less importance. The different ware which comes to market is sometimes called by the name of the trading town, sometimes by that of the manufacturing place, or else by the name of the province. The Hizen porcelain, also called Imari ware, is manufactured in Arita and its surrounding district, situated at about 45 miles distance from Nagasaki in a northerly direction. This is the ware which was first known to Europeans, through the Dutch who had a settlement upon the island of Desima, near to Nagasaki, and who for a few centuries enjoyed the exclusive privilege of trading with Japan. The Owari, or Seto porcelain, is made in Seto, a small place six miles from Nagoya, the principal town of the province of Owari. The Kaga, or Kutani ware, was formerly manufactured in the town of Kutani, province of Kaga (at present department of Ishikawa), but it is now made in the village of Yamashiro, of the same province. As regards the Kiyoto and the Mino ware, both are made in the places after which they are named.

About the time of the arrival of the Corean workmen in Arita, province of Hizen, another general of the Japanese army invading Corea, viz., the Prince of Satsuma, Shimadzu Yoshihisa, brought home with him a certain number of porcelain makers with their families, who settled in the neighborhood of Kagoshima. Here, after many experiments, they succeeded in producing the article now known by the name of Satsuma ware. Up to a few years ago they were kept entirely separate from the Japanese population, intermarriage with them being prohibited, and thus they have preserved to a certain extent their language and their customs. Since the establishment of the central government, however, they enjoy the same rights and liberties as the other subjects.

At a later period Satsuma ware was imitated in Kiyoto, Awajisima, and lately in Yokohama.

The articles of which the history has been briefly sketched, are those principally known and sought after by foreigners. A great variety of all kinds of earthenware used for household purposes, remains undescribed, which are very interesting to a professional man, but too manifold for a detailed

description within the limits of the catalogue. It should, however, be mentioned that amongst the earthenware there are several kinds which, differently from the above mentioned articles, are glazed, like majolica or faience, with a colored and easily fusible composition containing a large percentage of lead; there are even a few pieces of this kind with paintings under the glaze. As to the plastic arts, the creations of the Japanese artists are generally small figures, glazed or unglazed, mostly representing mythological personages or warriors.

Some technical peculiarities concerning the various articles will be explained under the head of the different classes, which are represented by the exhibited products.

CLASS 210-212.—STONEWARE, FAIENCE, ETC.

The most remarkable manufactures belonging to this class, and well known in foreign markets, are the Satsuma and the Awata ware, which latter is manufactured in one of the suburbs of Kiyoto. Both are made from a kind of porcelain-clay, very refractory, and which does not undergo a partial fusion like the genuine porcelain mixture, or, anyhow, not to the same degree. The glaze is composed of feldspathic materials and lixiviated wood ash, without any addition of lead or borax; when cooled it always presents a net-work of fine cracks. The final simultaneous baking of the body and the glaze takes place in a temperature much higher than that for baking the so-called biscuit before glazing. The ware may be considered as being a kind of semi-porcelain.

The old Satsuma ware was seldom made in large pieces. The general description of these articles comprises bowls, small dishes or saucers, tea-pots, scent-burners, etc.; in later years vases of moderate size have also been made, and vases of exceptional height and difficult workmanship have been manufactured for the Philadelphia Centennial. The decoration is mostly composed of bird and flower paintings, amongst which the chrysanthemum, the paonia, the fowl, the pheasants and peacocks take a prominent place; and it is further distinguished by the delicacy of the outline, the fine red and green colors, and by the tracings in thick gold lines of a dull color. More recently the Satsuma ware, and especially the vases, have been frequently imitated in Yokohama and Yedo.

The Awata ware was invented at a later period than the slightly buff-colored Satsuma ware, and is distinguished by a more yellowish tint; on this account it takes the name of "tamago-yaki," which means "egg pottery." The original decoration was formerly very different from the Satsuma designs, and consisted of very light sketches done with a few neutral colors. Recently, however, efforts have been made to imitate the European manner of painting flowers, but in many instances the modern pieces are decorated in the style of Satsuma ware or of Hizen porcelain.

An article of great similarity to those just mentioned, is manufactured on a small scale in the island of Awadji, opposite Hiogo; it is of a very delicate yellowish tint, has a beautiful glaze, and is also covered like the rest, with a network of fine cracks. The painting is done in vigorous black outlines, and with more or less transparent enamels, generally of a darker tint than those which are used for the Hizen porcelain. The principal material used, is a kaolin earth, produced by powdering and lixiviating a decomposed granite found upon the island near the manufacturing locality; the glaze is of a similar composition as that of the Satsuma or Awata ware.

Another article, made in the same village, consists of a strongly baked biscuit, chiefly composed of kaolin, glazed with a very fusible mixture of sand and oxide of lead, which, by an addition of copper oxide, or certain naturally colored clays, assumes a green, yellow, or brownish-red color, and shows but very few cracks.

A peculiar kind of unglazed stone-ware, resembling to a certain extent the wedgewood, is made in the province of Ise, and called Banko-yaki, from the name of the inventor. The material used for the greater part of this ware, is a brown clay, of such toughness, that teapots, and other small articles can be made extremely light and thin; it is decorated with paintings done in opaque enamels. White biscuit is also made in the same place of a very pure clay, and in later years a kind of marbled ware is produced by mingling of white and brown clay.

The Banko-yaki, shown in the exhibition, differs to a certain extent from the common article, but the original character of their ware can be understood by the unglazed brown tea service which is on exhibition.

The original article is the unglazed stone-ware of a purple brown, and sometimes of a light yellowish color. The smaller articles, such as teapots, etc., are made upon wooden moulds, by tamping, in all sorts of fanciful shapes.

CLASS 213.—PORCELAIN.

The art of porcelain making presents features, which, of course, in principle, are very similar to those of porcelain manufacturing in Europe; however, the machinery used is of a more primitive kind.

Whatever may be the nature of the raw material, be it quartz, felsite, kaolin, feldspath, or the peculiar porcelain-stone of Arita, it is always powdered by means of balancing pounders of a peculiar construction. These are composed of long horizontal beams, with a perpendicular crosspiece at one end, giving the whole the shape of a hammer, and with a water-trough at the other end. This instrument is put up wherever a small stream of water can be utilized; the water running into the trough, raises the pounder by over-weight, and running out at the end in consequence of the incline, allows it to fall down again, with the iron shod crosspiece dropping into a stone mortar, in which the materials are thus reduced to powder; the latter is then sifted, mixed with water and decanted.

No other machinery, such as the quartz or glaze mills of foreign porcelain manufactories, is used, and the consequence is that all the material which cannot be sufficiently powdered by the above described pounders (amounting often from 40 to 50 per cent.) is thrown away as waste. The fine powders produced by decanting are carefully mixed, and removed into flat boxes, where the water is partly drained off through a sand bedding, covered with matting, and partly tapped off from above the deposited clay; the latter is finally brought to more consistency by placing it on the warm furnaces. Long experience, combined with the good quality of the raw material, enables the manufacturers to prepare a clay, fit even for the production of very large pieces, such as vases from 6 to 7 feet in height. These are chiefly manufactured in Arita, whereas porcelain tables, painted slabs, fire-places and similar articles are mostly made in Owari. The throwing and shaping of the clay is done upon the common potter's wheel, which, in the town of Arita (Hizen), consists of a flying wheel and a working disc, 12 or 15 inches one above the other. These are united by a sort of hollow wooden prism, so as to form one system of wheels, which is placed over a vertical round piece of wood, fastened in the ground. To avoid friction as much as possible, this system of wheels is resting upon the pointed stick by means of a hollow piece of porcelain, set underneath into the working disc. By means of this lathe the workmen in Arita turn out large dishes of three feet in diameter, as well as the so-called egg-shell porcelain, not thicker than paper. For very heavy and large pieces, the lathe is turned by means of a driving cord.

In all other provinces but Hizen, the lathe is of a more simple and imperfect construction, the flying wheel being at the same time the working disc.

Moulds are also used, and made of ordinary clay. Since the Vienna Exhibition, the use of gypsum for moulding is taught to the porcelain manufacturers of different places, and will most likely effect an important progress. Some of the pieces exhibited at Philadelphia, have been made by the new process.

When the pieces have been sufficiently dried in the open air, they are shaped with sharp iron tools on the same lathe on which the first throwing has been done, and are then coated with a very pure white clay, so as to give the finished ware a better appearance, and to bring out with more intensity the fine blue color of the cobalt painting. After this coating, the ware receives the preliminary baking in small kilns built in the open yards of the manufacturing localities. The pieces are then painted with the oxide of cobalt, and afterwards glazed in the same way as in Europe. The glaze is always composed of a feldspathic material, either natural or produced by the mixture of different minerals, to which is added a certain quantity of wood ashes, freed from the alkali by careful lixiviation. The proportion of ashes depends on the place which the pieces have to occupy in the kiln, the heat of which is not quite uniform. With reference to certain peculiar kinds of porcelain, such as the celadon, or the craquelé, the materials used are not the same as for the white or common ware.

For the celadon, the body is the same, but the glaze is made of a mineral different from that which is used for the glaze of the white ware. The craquelé, *i.e.*, the body of the craquelé, is made from a peculiar kind of porcelain stone; but the nature of the net work of cracks, the size of the meshes, etc., depend, not only upon the thickness of the glaze and of the white coating underneath, but also on the degree to which the piece is baked, before and after glazing. The ware is finally rubbed over with Chinese ink, so as to render the cracks more distinct.

The kilns are of a peculiar construction, and are always built on the slope of a hill, in a line of from 4 to 20, according to the importance of the locality. The base of each kiln lies about 3 feet higher than the base of the foregoing one, so that, if all the kilns were uncovered, the whole of them would present the aspect of terraces formed by a series of platforms, each 3' high. The ground plan is in the form of a rectangle, or rather, of a trapezoid, the kilns growing wider and wider as they extend up the hill. The walls on the four sides of the ground plan being vertical to the height of a few feet above the base, gradually form a vault, the corners of which have been rounded off in such a way, that the upper part of the vault presents no corners at all. This somewhat complicated shape will be more easily understood, when it is stated that one of the large kilns in Arita has a length of 27', a depth of 18', and a height of 15' in the centre. The central section by the depth would resemble half an ellipse with the principal axis in a vertical position, while the section through the length of the kiln would be half of an ellipse with its principal axis in a horizontal position and raised 3 or 4 feet above the ground. The front wall of each kiln, *i.e.* the wall facing the lower end of the line of kilns, is pierced on the level of its floor by a series of holes, 8 to 12 inches high, and 3 to 4 inches wide; and in the opposite wall, which on account of the trapezoidal ground plan of the kiln, is a little longer than the front wall, there is a second series of similar holes, but at 3 feet above the floor, and consequently opening exactly upon the floor of the next kiln. In this way, a draught is established through the whole line of the kilns, which ends in a range of short chimneys, corresponding to the draught holes of the last kiln. There are no separate furnaces or fire places, but the fuel is thrown directly into the kiln. For this purpose, a space 0 m. 70 to 1 m. wide, has been reserved along that wall of the kiln, the air holes of which open immediately upon the floor, and is separated from the main part of the kiln by thick perpendicular fire clay slabs, about 30 m. 0 to 1 m. high. This separate narrow space communicates with the outside by means of an opening, 0 m. 50 high and 0 m. 15 wide, made into the side wall of the kiln. Through this opening the fireman very dexterously throws dried wood into the kiln, three pieces at a time, and notwithstanding that the kiln is sometimes 8 m. in length, fires it with all the required regularity. The current of air passing through the lower kilns reaches the wood through the holes in the front wall; the flame, deviated

by the upright fire clay slabs, does not strike the porcelain directly, but follows the vault, and the heat spreads more equally amongst the objects placed in the kiln. The opposite part of the vault is purposely made steeper than the side, whence the flame starts; consequently, the latter does not take the straight line to the opposite holes, but produces a sort of whirling fire, which takes the objects also from behind. The flame passing through from the lower kiln, where the firing is actually going on, into the following kiln, produces sufficient heat to render this latter red hot by the time that the firing is finished in the first. At this moment, the opening through which the first kiln has been fired, is closed up with fire bricks, and the firing begins in the second one.

By this arrangement, the principle of which is very similar to that of the modern circulating furnaces for burning bricks, the fresh air has to pass through the kilns that have already been fired, and reaches the wood with a high temperature, producing combustion on most favorable conditions, while the departing flame is used for heating the next kilns. Since each kiln is heated by the fire of the foregoing ones, before its own firing begins, it profits by an amount of heat which is the greater the farther up its place is in the line. This explains why the manufacturers have thought it to be more advantageous to construct the kilns of increasing size in following the line upwards. At Arita, for instance, the lowest kiln has a length of 7', a depth of 6', and a height of 6', whilst the last one is 27' long, 18' deep, and 15' high. The single separate furnace to begin the firing is situated at the lowest end of the line. The fuel is pine wood which has been barked and dried in the oven. It may be remarked that the firing, even in the larger kilns, does not generally last more than 14 hours, but it should be borne in mind that they are already red-hot when the firing begins.

The setting of the pieces in the kiln is done with precautions similar to those observed in Europe, to prevent their distortion. The only difference is that in general only a small number of pieces are protected by fire-clay boxes or saggers, while the greater part are directly exposed to the fire; but in this respect improvements have been lately introduced by some of the principal manufacturers.

In order to prevent the dust from falling down from the vault, the inner surface of the kiln is coated with a glazing mixture before the firing begins. The pieces are arranged upon fire-clay stands, made in the shape of round tables, and placed one upon another to a height which a man can easily reach. The upper half of the large furnaces remains entirely empty, but surplus height of the vault is necessary to prevent it from caving in, which would certainly happen were it too flat.

The kilns are constructed in a manner which has the great advantage of being extremely cheap. When the floor is prepared and the side walls erected 2 or 3 feet above the ground, a centering is made by placing within this space one or more poles made of young trees, with the branches cut in such a way as

to give the upper end the shape of a fork. The length of these poles corresponds to the height of the vault in the place where they are erected. Young pine-trees are then fastened along the inner sides of the walls by one end, then bent over the uprights, and fastened with straw-ropes in such a way that the whole centering represents a vaulted net-work with wide meshes. Long strips of bamboo are then tied to the main centering, so as to produce, finally, a sort of basket-work, leaving only such small interstices that the building material can not fall through. A mixture of fire-clay, cement and broken fire-bricks, with enough water to give the mixture sufficient plasticity, is now placed on the centering. The kiln builders, using their hands only, cover the centering with this mixture, taking great care to make it as compact as possible. When the material has settled down and has become sufficiently dry, without entirely losing its plasticity, the exterior is beaten with heavy wooden mallets, in order to harden and to smoothen it. The vault is now solid enough to stand without the centering; this is thereupon taken away and the inside smoothened and hardened with small mallets. When repairs are necessary, the damaged part of the kiln is broken away and a centering built at the required place in the manner described above, whereupon the hole is filled up, this time with fire-bricks and not with the above mentioned mixture. Thus, after a certain number of repairs in different places, almost the whole of the vault becomes composed of fire-bricks. These kilns are said to last fifteen years, and even the largest do not cost over 60 dollars. Their shape and dimensions vary in the different provinces, the walls being more or less steeply vaulted. The above description refers to those kilns of Arita which seem to be the most perfect. The kilns used for baking the porcelain before glazing are of a similar shape, but smaller and always single, each manufacturer having his own kiln on his premises. But the finishing kilns belong to the community, and are situated here and there on the boundaries of the town or village; they are rented to the different manufacturers. In the town of Arita their number amounts to over 200, and they are fired in turns, so that each kiln is used only 6 or 8 times a year.

The greater part of the articles which are baked in these kilns belong to the kind called "Sometsuki," or porcelain decorated with blue paintings underneath the glaze; this is done with a native cobaltiferous ore, or with a purer material imported from China. Almost all the ware made for home use is "Sometsuki." Another part is left white, in order to be decorated on the glaze with colored enamels, which have to be baked in peculiar furnaces at a lower temperature. This kind of porcelain is manufactured chiefly in Hizen, and mostly for the foreign market. The chief ingredients of the enamel consist of powdered glass (a sort of flint glass composed of silica, litharge or red lead, and nitre), with an addition of white lead or of silex powder in various proportions, for the purpose of giving to each enamel the proper fusibility.

The coloring oxides to be mixed with the flux are very few in number, viz., copper, manganese, antimony, red oxide of iron, impure oxide of cobalt (for the black), and a sort of smalt from China; finally, gold for carmine tints, mixed with powdered glass, and for gilding, with a slight addition of white lead or borax. None of these enamels are melted beforehand in a crucible, but the ingredients are mixed by the painter himself and used directly for painting, so that the green, the yellow, the violet, etc., only appear when the pieces are baked in the muffle. Of later years foreign enamels have been used, but the painters are more and more inclined to return to the original native style of decoration. Porcelain painting, to a much smaller extent than in Hizen, is done in Owari, Kiyoto and in Yedo on white Owari ware.

The manner in which this decoration is produced, differs very much from the European method. In the first place, the whole design is traced in black lines, and the shades, when at all, are only indicated by strokes. The colored enamels are put on either in a thin layer when they are opaque, such as the red, the yellow and the black, or in a thick layer when they are to produce, after melting, the effect of colored glass, through which the black tracing of the design is visible. Sometimes relief paintings are produced by first coating the porcelain with a white opaque enamel, which contains no oxide of tin, but is merely a mixture of glass, white lead and powdered stone, and on which the others colors are then painted. Generally speaking, the whole decoration is finished in one baking; very seldom it requires to be baked a second time. As to the character of the Hizen porcelain decoration, it is so well known in foreign markets that it needs no special description. In Owari, Kiyoto, Mino, the great bulk of the porcelain consists of blue ware or Sometski; but a remarkable article produced in Kiyoto is the Eraku ware (so named after the inventor) which consists of porcelain painted over with red oxide of iron, on which ground all kinds of mythological ornaments are applied in gold.

Kaga ware is decorated in a most characteristic way. It is distinguished by the very fine gold ornamentation, generally on red, sometimes on black grounds, leaving open fields with paintings of flowers, birds or personages, either traced in red and gold outlines, or painted with transparent enamels of a similar composition as those used in Hizen. These latter paintings are characterized by the vigorous tracing of the black outlines under the enamels, and the power with which these latter have been applied. Although the ware in itself is not generally of a very fine quality, this sort of decoration in gold and red is very rich and most effective. In later years, when better white ware has been manufactured in Kaga, or imported from other places for decoration, one of the painters has produced some excellent specimens, presenting a happy combination of the painting in red, black and gold outlines, with the above mentioned peculiar style of decoration, originated by a celebrated porcelain maker of Kiyoto, called Eraku.

It becomes more and more apparent, especially after the experience gained at Vienna, that the mere imitation of European style will be abandoned, and that all the efforts of the manufacturers will tend to preserve the genuine character of Japanese art, together with its good traditions. This has been especially the case, if not for all at least a large part of the ceramic products exhibited at Philadelphia. It may also be expected that the sight of the manifold and beautiful creations of ceramic art in Europe will induce the Japanese manufacturers, to utilize the great variety of raw material which they can dispose of, for the production of some new articles of artistic value.

FURNITURE AND OBJECTS OF GENERAL USE IN CONSTRUCTION AND IN DWELLINGS.

CLASS 217—228.

The native furniture being adapted to the manners and customs of the country, is generally of a very light but elegant construction, and can easily be moved in case of danger from fire, etc. There are but few pieces which might deserve the appellation of heavy furniture, such as, for instance, shelves, the so-called cabinets, screens, etc. But latterly the cabinet-makers have been exerting themselves to produce suitable furniture for the numerous houses now furnished in foreign style, and generally with a marked intention of giving it a national character, either by means of ornamental carvings or else by making use of lacquer. A short description of the manner in which lacquering is done, may be of some interest. (For the material see Class 202.)

This operation depends of course on the peculiar properties of the lacquer and the effect to be produced. The raw lacquer, chiefly the Seshime-urushi, is used for the priming, with an addition of burnt clay-dust or fine stone-powder, so as to produce a coating of the utmost hardness. The prepared lacquer, after having been strained, etc., is slightly transparent when applied in thin layers, and possesses a color similar to that of shellac; this transparency is occasionally increased by a small addition of drying oil, which, by mere hardening, produces a sufficient glossiness of the surface, whereas the pure lacquer has to be polished. For coloring, the lacquer is mixed with cinnabar, orpiment, red oxide of iron, or Prussian blue, etc.; the black lacquer is prepared in the peculiar manner described under the head of Class 202. Sometimes the colored lacquer is used, and when the final coating is required to be of a transparent nature, either the unmixed strained lacquer, or that peculiar kind of lacquer which has been thinned by an addition of oil is used. The mixing of the lacquer with hardening or coloring powders is generally effected by the lacquerer himself on a wooden board with a wooden spatula just before using it. Finally, the thick mixture is

forcibly strained through a piece of the above mentioned paper, called Yoshino-gami. Should the lacquer become too stiff for use, some bits of camphor are crushed and thoroughly mixed with the lacquer by means of the spatula, whereupon it becomes more liquid. Before beginning to lacquer, the workman sometimes lines the exterior of the object, and especially the joints and corners, with linen gauze or Yoshino-gami, pasted on with raw lacquer, so as to give the object greater solidity and to prevent its breaking. The primary coatings are put on with a mixture of raw lacquer and burnt clay-dust, and afterwards stone-powder; when hardened they are rubbed with a grindstone, to smoothen and polish the surface. The next two or three layers are done with inferior kinds of the black or colored lacquer, according to the color to be produced. The lacquer is applied in the first place with a wooden spatula, and afterwards with a very stiff plat brush, so as to smoothen and spread the lacquer equally. The surface is then ground with water and charcoal, of which latter two kinds are used, the one coarse and hard, and the other light and soft. As a peculiarity, it may be stated that the freshly lacquered objects are placed in large wooden boxes of which the inside has been sprinkled or washed with water, so that the process of hardening takes place in a dark and damp atmosphere; according to the statement of the professionals, this precaution is absolutely necessary to produce the speedy hardening and fine appearance of the lacquer. The final coating is done with the best lacquer of the kind required in the particular case, and after having been carefully ground, it is then polished with powdered deers' horn. The black lacquer, when finished, is repeatedly rubbed with a ball slightly dipped in Seshime lacquer, and each time carefully polished with the above mentioned deer horn powder. The gold sprinkled lacquer, called Nashiji, is produced by sifting a certain amount of gold-leaf, cut into small pieces, on to a fresh coating of Seshime lacquer. When hardened the surface is smoothed and then coated with a choice quality of lacquer called Nashiji-urushi, which is prepared by carefully straining and mixing it with a small quantity of gamboge. This lacquer when applied in a thick layer is opaque, and only becomes transparent in thin layers; so that by grinding the final coating with charcoal, the gold sprinkles underneath can be made more or less visible according to the will of the artist. Finally, after being carefully polished, the object receives a very thin coating of the same lacquer to produce the gloss. For common ware tin-foil is used instead of gold-leaf, but owing to the yellow color of the Nashiji-urushi, the tin-foil has a gold-like appearance.

The manipulations which have been briefly described may be modified in many ways, and this is done chiefly for the purpose of producing cheaper ware. The principles of lacquering always remain the same, but the number of the coatings can be reduced, the priming may be done with cheaper materials, or the lacquer may be of inferior quality, etc.

The final decoration of the objects, however, is an operation which admits an almost indefinite variety of device, and consists either of paintings or of incrusterations of mother-of-pearl shells, etc., or else of a peculiar preparation of the surface.

The relief paintings are done with a mixture of red oxide of iron and lacquer, upon which fine charcoal-powder is brought to bear before the lacquer has hardened. This is again coated with lacquer and colcothar, the operation being repeated until the required relief has been produced. The metallic powders, viz., gold, silver, bronze, etc., are applied to the final coating whilst the lacquer is still in a viscous condition, so that the powders being, so to say, soaked into the fresh lacquer, a thick layer chiefly composed of metal is produced. After that the lacquer has become hard, the painter removes the surplus of the powders, and either polishes the painting or simply rubs it over, according to the result desired. It is unnecessary to add that lacquer painting is an art which admits almost of as many different methods of producing a certain effect as that of oil painting. Indeed, although the painter in lacquer has only a very limited number of bright colors at his disposition, he can make use of a large number of dark, brown and neutral tints, and also of various metallic powders, besides which he has it in his power to modify the surface as he pleases, viz., making it dull or brilliant, smooth or grained, producing relief or flat pictures. The lacquer can even be carved, and, finally, the artisan can incrustate mother-of-pearl shell, ivory, thin metal, or anything he likes into the lacquer. By mixing a sort of paste made of bean powder, or the white of eggs, with the lacquer, he can thicken it to such an extent as to give it a kind of plasticity, admitting the possibility of making impressions which remain visible after hardening. This is done, for instance, with the so-called Tsugaru lacquer, which presents a marbled appearance with red, brown and green veins. The first coating is done in black lacquer which is mingled with white of egg, and by tamping with a ball of cotton or some similar operation, the surface is made to present a mass of irregular depressions and elevations which remain after hardening. The latter are partially ground down, and a second coating of a different color is applied and similarly treated. After having finished the coating with variously colored lacquers, the surface is ground until all the successive layers appear again in veins of different colors. It would take too long, and would even be impossible, to describe all the devices made use of by Japanese artists for their finest specimens of lacquer. To appreciate the really beautiful creations of this art to their full value, it is necessary to examine the pieces down even to the smallest details, to compare the common pieces with those of the best workmanship, and in this manner to educate the eye to a certain extent. There is little doubt but that anybody who has had such opportunities, will become more and more fond of these products, which combine the most varied devices of technical as well as artistic ingenuity so admirably. It need scarcely

be added that the ordinary lacquer does not present all the features of the fine specimens; for this purpose the different methods of lacquering and painting have been considerably modified in order to produce cheaper articles; nevertheless, the nature of the material gives a beautiful appearance even to such inferior ware. For further details concerning the art of lacquer painting, reference should be made to the pamphlet published on this subject by order of the Department of Public Instruction. (See also additional notes at the end.)

The finest lacquer is made in Tokio (Yeddo) and Kiyoto; the cheaper articles are mostly manufactured in the interior, as, for instance, in the provinces of Aidzu, Yechizen, etc. A peculiar kind of lacquer is the so-called Wakasa ware, having a marbled surface chiefly of green and red lacquer, or else showing brown colors with a sort of metallic lustre produced by tin-foil beneath the final coating.

The art of lacquering is already more than a thousand years old, and pieces made in those ancient times are still extant in the country. Very fine specimens of lacquer over 200 years old may be seen in the temple of Shiba in Tokio, and also in the Philadelphia Exhibition. The durability and hardness of the material admits its being used for all sorts of domestic implements, even for plates and drinking bowls. It is owing to this power of producing exquisite works of art, and of combining lacquer with any amount of precious metal, according to the artist's fancy, that lacquer takes about the same place in Japan as jewelry, works of precious metals and similar artistic products do in other countries, and the fact that quite as fine lacquer as that of olden times is to be found in Japan now-a-days, will be abundantly demonstrated by the articles exhibited. But lacquer is not merely used for smaller objects; larger constructions such as, for instance, the interior walls of certain temples, the ceilings, the columns, the staircases, etc., are lacquered and painted, or else richly gilded. It should be remarked here that a peculiar kind of lacquer is prepared and used for the final coating to which the gold-leaf is applied. It forms a very smooth and brilliant surface of a light brown color, and is gently rubbed with a ball dipped in varnish, so as to moisten it just enough to produce the solid adherence of the gold-leaf.

Paper gilded or silvered in this way is used for all kinds of ornaments for coiffures; gold threads in the silk-brocades and embroideries are prepared in the same manner.

The art of carving lacquer was introduced into Japan by a Chinese artist, and is chiefly done in the red lacquer, resembling the so-called Pekin lacquer. But it has been more or less modified, and is also done in black lacquer; the carvings mostly represent flowers, birds, and also human figures in imitation of the Chinese. The Guribori may likewise be included in this species of carved lacquer. Thick layers of various colored lacquer are successively applied, one upon the other, the final one being always of a dark brown color; broad

meandering lines are thereupon engraved with inclined faces, upon which the different layers reappear in parallel lines.

The "Shunkei-urushi" should also be mentioned, which, being transparent and of a yellowish tint, is used to produce upon wood an effect similar to that of French polish. The surface is first prepared with a primary coating of glue and alum, so as to fill up all the pores, and is then polished and sometimes painted with gamboge or safflower, together with the sap of unripe persimmons, which give it a brighter appearance. Afterwards the coating of varnish is applied with a stiff brush, and as a certain percentage of oil has been mixed with the lacquer, it requires no polishing, but acquires the necessary brilliancy by mere hardening. The most celebrated lacquer of this kind is made in Akita, and it is reported that the process is effected at sea on board the ships, so as to avoid all dust and to allow the lacquer to harden in a moist atmosphere, which produces a gloss of remarkable beauty.

Finally, mention should be made of the lacquer ware inlaid with mother-of-pearl. Pieces of shell having a beautiful natural color are selected for the finest specimens of lacquer, and are only made use of in moderation, to give more variety to the gold paintings. But for the common ware, where whole pictures, flowers, etc., of mother-of-pearl shell are represented, the thin plaques of this material are painted with colors on one side, then covered with tin-foil, and either gummed on with lacquer or else laid upon the freshly lacquered surface. When the lacquer has hardened the whole piece is coated with black lacquer, so that all the designs disappear. Afterwards the hard lacquer is ground in the first place with a stone, then with a piece of charcoal, whereupon the mother-of-pearl reappears polished. The tin-foil underneath has the effect of increasing the display of colors.

YARNS AND WOVEN GOODS OF VEGETABLE OR MINERAL MATERIALS.

CLASS 229.—COARSE FABRICS OF GRASS, ETC.

Mattings will remain a most important article of furniture, as long as the people of Japan continue to retain the old fashion of sitting on the floor. The ordinary mats in Japanese houses made of the materials mentioned below and lined with rice-straw, are more than an inch thick and throughout Japan are all of the same size, viz., 6 feet by 3 feet. As the rooms are usually of corresponding dimensions, the mats can be removed from one room or one house to another, and will always be found to fit, as will also the sliding doors and windows, which almost everywhere are of the same dimensions.

The surface of the mats in rooms, and mattings of better quality in general are made of the “*juncus effusus*” (the pith of which is used for candle and lamp-wicks) in the province of Oomi, of the *Isolepis* in Bingo, and of the *Cyperus rotundus* in Satsuma and Bungo. For the commoner mattings rice straw and also different kinds of rushes are used; for instance, “*Sçirpus lacustris*” L., *Hydropirium latifolium* Griseb., and *typha*, which plants grow almost everywhere. An interesting portion of the Exhibits in this class is formed by the rain coats made of certain kinds of grass or of palm-leaves.

COTTON YARN AND FABRICS.

CLASSES 230-232.

The cotton industry is of comparatively recent origin. Old records inform us that in the year 799 A. D. a plant yielding fibre resembling cotton, was introduced by a native of India, and afterwards cultivated on a small scale in the Southern portion of Japan; but as this cultivation was given up after a lapse of some thirty years, it is not known exactly what species the plant in question belonged to. The actual cotton plant is said to have been introduced only some 300 years ago, between 1558-1570 A. D. from China. As to the manufacturing processes, they are identical with those of India or China. Ginning is done by passing the raw cotton, one pod at a time, between a pair of wooden rollers a little over one inch in diameter, leaving the seeds behind. The cotton is beaten, opened and transformed into a lap by means of a bow, the string of which is made of the sinews of a kind of whale or dolphin; the workman holding the bow a little above the raw cotton, which is spread out on a bamboo tray, beats the string with a kind of wooden mallet, and at each vibration it chips off the clean fibres, which arrange themselves on the other side of the bow, in such a way as to form a lap. The spinning apparatus like that of India, is composed of one spindle moved by a light wheel; the spinner keeps a roll of cleaned cotton in one hand, and with the other turns the wheel, first in one direction for twisting, and then in the opposite direction for copping, or winding up. Cotton mills with foreign machinery are but few in number, one in Oji near Tokio, and another in Sakai, not far from Osaka, the property of the Board of Commerce and Agriculture.

The Japanese loom ordinarily used, resembles the common European hand-loom of the last century in its construction, but with this difference, that the reed is not set in a movable swing-frame or lay, but hangs down from the top of the loom by a string, which about two feet above the centre of the reed branches out into two ends which are fastened on both extremities of the reed.

Amongst the dye stuffs used for cotton, the most important of all is undoubtedly the indigo yielded by the “*Polygonum tinctorium*.” The plants, which grow to

a height of 2-3 feet, are cut into 3 parts, the upper part with the greatest number of leaves being the richest in coloring substance. For the best quality the leaves only are used, which, after having been exposed to the air and sun during a few hours only, where they darker considerably, are put into straw bags and kept for the purpose of afterwards undergoing a longer treatment. This consists in moistening the leaves with a certain amount of water, the exact quantity of which depends on the nature of the leaves, and the greatest care must be taken to prevent its being either in excess or in deficiency. They are then spread out upon and covered with mats during a few days, after which the operation is repeated during a period of 80 days, about 25 times for the best and about 9 times for the inferior leaves. Having undergone this kind of fermentation, they are then pounded in wooden mortars and in quantities of about 14 kilos., for two consecutive days, so as to become reduced to a sort of paste which is then formed into balls of a dark blue color. These balls of crude indigo, with an addition of bran and potash-lye prepared from wood-ashes, form the material used by dyers in the steeping vat. The other dye stuffs are gall-nuts for black, iron protosulphate for black and brown, turmeric and the flower of *Gardenia florida* for yellow, madder and safflower for red, Brazil wood, and in modern times all sort of aniline-colors are also used. The seed capsules of *Carthamus tinctorius* are repeatedly soaked in water and then pressed, so as to wash out the yellow coloring substance; these pressed flowers form the article which comes to market. The red dye is prepared by treating the flowers with potash lye, and precipitating the carthamine by means of vinegar prepared from plums. The fine-powder suspended in the liquid is received on hemp-fibres, whence it is afterwards washed out again by means of a potash lye.

The processes of dyeing are mostly very simple, the only mordants being alum and infusions prepared from gall-nuts or from the bark of certain trees. Various methods are used to produce the patterns in woven fabrics, but none of them can properly be designated by the word "printing." Occasionally, very delicate patterns in white outlines are produced by tying the yarns to be used for the warp with another string at certain regular intervals; so that, when the yarn is dipped into the dye, the places covered by the string in question remain white. The warping and beaming is then done in such a way that the white spots on the warps produce the required pattern. A cheaper process consists of preparing a wooden board with the pattern in relief, and pressing the folded cloth between this board and a second smooth one. In this manner, the whole cloth is dyed at once; and similar to the yarn in the process mentioned above, the cloth remains unstained in those places where it had been pressed, thus leaving white designs at regular intervals. In order to produce colored designs of a uniform dye, the patterns of the design are made of stiff paper and laid on the cloth, which is then entirely covered (also the paper pattern) with a paste prepared from starch, or with a sort of carragheen moss mixed with chalk. Afterwards,

when the paper patterns are removed, the designs are the only places not covered with the paste; and, by immersing the cloth into the dye, the designs alone will be colored. Finally, the paste, which of course does not immediately dissolve in water, has to be washed out. By repeating this process, any number of uniform colored patterns can be applied to the same piece of cloth. But it will be easily understood, that this process is insufficient to produce the very delicate graduation of tints, on account of which Japanese cotton cloth has been so often admired by foreign calico printers. This graduation is not done by printing, but by painting with a brush, in a manner similar to water-color painting. Occasionally, the designs are cut out of paper, and are used like the patterns for architectural and ornamental stencelings in Europe.

Foreign cloth of all kinds, shirtings, prints, etc., and also cotton yarns, form now a considerable item of the list of imports. The native cloth is woven, either in small manufactories containing ten to twenty looms, or else in the houses of the farmers and peasants, where the female members of the family do the necessary spinning and weaving to supply the wants of the household, occasionally with very primitive machinery. But in general, it must be acknowledged that the home-made cloth is of a very strong and durable texture. Since the Vienna exhibition, one of the Kiyoto weavers, Mr. Date, whose silk goods were so much admired by the jury, has constructed a loom for weaving carpets of the Brussels kind, and on the principle of velvet making.

The principal seats of cotton industry are the provinces of Kawachi and of Harima, the former producing annually over 2,500,000, and the latter more than 1,500,000 pieces. A very fine and well known cotton cloth is made in the Loo-Choo islands.

LINEN AND OTHER VEGETABLE FABRICS.

CLASS 233.

The most important of the textile plants, and used for fabrics of superior quality, belonging to this class are hemp, and some varieties of China-grass (Boehmeria). Flax is not grown in Japan. Other fibres producing coarse cloth, and mostly used for strings and ropes, are those of the *Corchorus capsularis* (jute-hemp), of *Pueraria Thumbergiana*, of *Hybiscus syriacus*, of *Musa basho* (a sort of Manilla hemp), of *Wisteria chinensis*, and the bast of *Salix buergeriana* and *Tilia cordata*.

The processes for preparing the fibres of all these plants are generally identical. The stems of the hemp, for instance, having been soaked in water, the bark is stripped off, and if necessary, cleaned from the outer dark epidermis, by being scraped with an iron tool. Afterwards, the inner fibres are repeatedly washed and bleached; and then brought to market in this state. As the pro-

cesses of bracking, swinging, and hackling are not applied, the manipulation of spinning is rather tedious, all the fibres having to be taken off, one by one, and the ends knitted together, so as to form a thread of sufficient length to be spooled and used for weaving. The principal centre of the manufacture of hemp fabrics is in the province of Yamato, the ancient centre of Japan, where Nara, formerly the capital of the empire, alone produces annually about 400,000 pieces. Very fine China-grass cloth is manufactured in Yechigo, to the north of Tokio, on the west coast of Japan, where this industry was commenced, in the year 1660 A.D. The annual production amounts to nearly 100,000 pieces, from 9-10 yards in length.

The use of hemp for the manufacture of cloth is very old, as prior to the introduction of silk weaving, it was the only textile fabric in the country. Wool has never been produced in Japan, even to this day; and the production of cotton, as has been already shown, only dates from the 16th century.

An important branch of the textile industry is formed by the manufacture of mosquito-nets, for which the bark of *Tilia cordata* is used. And it may be mentioned, as a peculiarity, that the paper made of the bark of "*Broussonetia papyrifera*" is also used for making cloth. It is cut into thin strips, which are twisted together and spooled, to be used for the woof of the fabric, while the warp is composed of silk or hemp threads. But this industry is of no importance, the annual production of the principal manufacturing place amounting only to 250 pieces.

SILK AND SILK FABRICS.

CLASS 242-249.

Silk is the principal export from Japan, and constitutes nearly three-quarters of the total merchandise exported. Although the silk-trade comprehends hardly any thing but raw silk and silk-worm-eggs, the exhibition will prove as it did at Vienna, that the manufacture of silk-fabrics has attained a very high degree of perfection; and this is all the more to be appreciated as the spinning and weaving machinery is far from being as perfect as in Europe. A complete description of all the manipulations would extend beyond the object and limits of this catalogue, and would be incomplete without diagrams. But the following notes may be of some interest to the reader, whom we refer to Class 668 for details concerning the cultivation of the mulberry tree and the rearing of silk worms. It is stated in ancient records that after the Corean invasion in the earlier part of the third century, certain Coreans were brought to Japan by the empress Jingo-Kogu in order to introduce the cultivation of mulberry and of the silk-worm. The most ancient book on Japanese history, the "*Nihon-gi*," adds that towards the year

330 A. D. some other Coreans were sent to China for the purpose of engaging competent people to teach the art of weaving and preparing silk-goods. They brought back four girls, two of whom were seamstresses and two weavers, who instructed the court and the people in the art of weaving plain and figured piece goods. Their memory has been honored by a chapel in the province of Setsu. Two official boards were appointed for encouraging and developing the new industry; and a few centuries later, the empress Suiko (593-620 A. D.) issued strict regulations concerning the dress to be worn by people of various ranks. The capital of Kiyoto was the principal seat of this industry, and still remains so, at least as far as figured pieces and gold brocades are concerned. However, the town of Kiri in the province of Kotsuke (or Joshiu), to the northwest of Tokio, where weaving was first commenced in 750 A. D. and where the silk industry has been much more fully developed since 1820, is now in advance of Kiyoto, chiefly as far as plain goods are concerned. In Kiyoto only 712,897 pieces were manufactured in 1874, whilst in Kiri 1,536,639 pieces were manufactured during the same period, each piece having a length of about 8 metres. Other places, mostly situated in the central part of Nippon, are noted for some specialty such as, for instance, the provinces of Mino and Oomi, where crapes and velvets are made; the province of Chikuzen, upon the island of Kiushiu, is famous for its excellent "obi," broad and long silk sashes worn by Japanese women.

In commencing a brief sketch of the manipulations of spinning and weaving with the apparatus for reeling the silk, it should be stated that in Japan the apparatus consists of a small portable clay-oven with a cast-iron basin, and of a wooden reel placed to the left of the reeling girl, who turns it with her left hand, while the right hand is used for tending the cocoons in the basin, generally making two threads at the same time. The latter are guided by eyes made of hair, and the uniform spreading of the thread upon the reel is effected by a combination of swinging rods and a spiral groove in the revolving cylinder, which regulates their motion; the filaments pass to the reel without crossing. In latter years considerable improvements have been effected by the introduction of more perfect machinery of the French and Swiss system. In 1873 two reeling establishments were erected by order of the government, one in Tokio with 96 basins, and one in Tomioka, province of Kotsuke, constructed for 300 basins. There are now 19 new establishments with an average of 60 basins each. The reeling, doubling and throwing of the silk are effected on various equally simple machines, which it would take too long to describe here. After the Vienna Exhibition apparatus of a more perfect construction was brought to Japan for experimentation, and is now at work in the Tokio Museum.

With reference to weaving, there is a great variety of articles, such as satins, taffetas, baréges, velvets, damasks, crapes, double cloth, all sorts of lanced or figured fancy cloth and brocades, often of such excellent workmanship as to excite the admiration of all foreign experts. The loom on which these splendid

figured goods are woven, is made on the principle of the old draw-loom which was used in Europe previous to the invention of the Jacquard loom, with this difference, that the simple or symbolt, *i. e.*, the arrangement of the cords by which the warp-threads are drawn upwards, is placed on the top of the loom where the draw-boy is sitting. The lashing of the symbolt is done by special men, in accordance to patterns drawn upon a kind of paper prepared in a similar manner as the European point-paper. For the warp and woof of the various kinds of piece goods different silk is used, properly selected, after long experience, so as to satisfy all the important conditions of price, quality, and manipulation. The dressing of the warp is done with a gluish decoction of the "Fu," a kind of fucus, which is used in many industries. A peculiar article worthy of the attention of foreign industrials, is the very strong gilt paper, thin strips of which are woven into the gold brocades. For weaving purposes only the paper strips are used, which have the advantage of leaving to the goods all their flexibility. For embroideries these paper strips are rolled in spiral lines upon a cotton or silk thread, and thus take the shape of round gold threads of extreme fineness and beauty in the best kinds.

The finishing operations, when both sides of the piece are similar, consist in dipping the piece into water mixed with a small quantity of paste prepared from starch and the above mentioned fucus, then wringing and drying it in the shade, and afterwards subjecting it to a sort of kneading manipulation, in order to render it softer. When the pattern is only on one side the piece is rolled on a wooden roller, together with a cotton cloth, the right side outwards, and then smoothened by being rolled under a heavy stone. After this it is spread out and sized, the wrong side being turned upwards; when dry it is again wound round a wooden roller, this time with the right side inwards, and rolled under a heavy stone; finally it is dried over a stove. Crape is produced by using for wooping alternate threads twisted in opposite directions, and of a much closer twist than ordinary threads. When the piece is finished it is dipped in cold, then in hot, and again in cold water in rapid succession, and afterwards rolled and dried. The different effect of these operations on the two kinds of woof threads produces the craping.

The weaving establishments of Kiyoto are all located in one quarter of the town, and seldom contain more than 20 looms each. The brocades and the heavy silk for general use are made by men, whilst women and girls are employed for the preparatory manipulations, and for the weaving of lighter piece goods.

In dyeing the threads or the piece goods, the preliminary operation consists in boiling them for a few hours in a potash lye, prepared from rice-straw ashes, in order to prepare them for a solid impregnation with the dye. Before boiling, the threads are put in a bag; and the piece goods are washed in water, in order to remove the size used for dressing the warp before weaving. Japanese dyers

have two different modes of dyeing—the one consists of the ordinary dipping process, the other of keeping the goods for a long time in the dyeing solution. Only vegetable dye stuffs are used with copperas for black and alum for mordanting. Blue colored silk is dyed with indigo in the same way as cotton. Black is produced by first soaking the goods in an infusion prepared of the bark of “*Myrica nageya*,” gall-nuts, and the skin of pomegranates, with an addition of ferruginated water, and by afterwards applying a solution of copperas. These operations are repeated as required. Different shades of brown are obtained by the application of alum, weak tannic infusions, and Brazilwood. Purple is produced by *Lithospermum erythrorhizon*. The goods are soaked in a decoction of this plant and in another of camelia leaves, alternately, after which they are rinsed in water. These operations are repeated several times. A beautiful dye is obtained from the safflower, and exhibited samples will bear witness of the great skill with which the Japanese dyers use this dye stuff. The grounding of the goods is effected by a decoction of turmeric and rice vinegar. The carthamine-bath (see the note on carthamine, class 231) is prepared with the vinegar obtained from plums and rice; and, finally, the color is vivified by a decoction of the bast of “*Evodia glauca, Miq.*” (belonging to the family of the *Xanthoxylaceæ*), in rice vinegar. For rose colors, safflower is used alone, without either turmeric or *Evodia*.

It will be seen by these short explanatory notes that in general mordants are but little used, and that in most cases the dye is due merely to the thorough impregnation of the fibres with the dye-stuff. Since the Vienna Exhibition, the foreign principles of dyeing have begun to be introduced and taught. Aniline colors, mostly such as are soluble in water, have been imported in considerable quantities, and are used for cotton as well as for silk. A peculiar manner of dyeing crape consists in drawing it upwards in several places by means of hooked pins, so as to form small conical elevations, round the top of which a thread is tightly bound. Whilst dyeing, those places remain uncolored, and when the threads are removed, the whole surface presents a number of small elevations, all surrounded by white circles. Sometimes threads of the Yamamai silk are mixed with the warp of the crape, forming stripes. This silk does not take the dye, but retains its natural yellowish color, so that, by dyeing the whole piece simultaneously with safflower for instance, red with yellowish stripes is produced.

CLASSES 250-251.—CLOTHING, JEWELRY, AND ORNAMENTS.

As foreign fashions of dress have been adopted to a great extent by the Japanese, and, further, as the military are also being uniformed in European style, a large number of places now exist in Tokio, and in other localities, where such clothing is made. In most cases, sewing machines, which may be counted by the hundreds, are used. Boots and shoes are also extensively made, machines being used for their manufacture in military establishments.

The art of braiding straw and other materials is well known in several parts of Japan, and has latterly been applied to the manufacture of hats and other articles, either of straw, of the fibres of the "Wisteria Sinensis," or of the bast of certain kinds of trees.

CLASS 252.—LACES, EMBROIDERIES, ETC.

Among the products of Japanese silk industry, a most remarkable one is formed by the embroideries, which are frequently used for ornamenting ceremonial dresses, theatrical costumes, draperies, etc., and which latterly have been applied to articles destined for foreign use. Very beautiful designs are produced by combining embroidery with painting (or what foreigners would call printing) on silk. Birds, flowers, and various kinds of figures are produced in this manner. Nobody will deny the exquisite workmanship of some of these pieces, which are *chef d'œuvres* of patience and skill. In general, they are made by male experts, and not by women, as it might be supposed; neither do they form what is generally called a domestic industry.

CLASS 253.

Jewelry and other similar articles of personal adornment, are only used by women; and consist exclusively of ornaments worn in the hair, such as artificial flowers, large hair-pins made of glass, metal or tortoise-shell, articles which belong rather to the following class. Latterly gold rings, chains, brooches, etc., have been made in imitation, more or less, of foreign articles.

CLASS 254.—FANCY ARTICLES.

The number of articles appertaining to this class is very great, and includes a large variety of those objects for the production of which Japanese industry seems so specially well adapted, not only by reason of the neatness of the workmanship, and the harmonious combination of bright colors, but also on account of the attempts to make even the commonest objects, to a certain extent, pleasing to the eye. As these articles form an important accessory of Japanese life, they are extensively produced, and with an elaborate system of division of labor. Fans, ornaments for girls and women and toys of which there is a large variety, may be counted amongst the principal articles of manufacture. Generally speaking, the important holidays have either some particular adornment or amusement pertaining to that special day; and the boys as well as the girls, have each one special holiday in the year, when they are presented with all sorts of toys, bearing reference to their future deeds and duties in life, the boys chiefly with military apparel, and the girls with miniature imitations of objects, used either in the household, or for the accomplishments which they must acquire in order to be considered well educated. Great luxury is frequently displayed on dolls, or rather on small figures richly dressed in silk

and brocades, representing either scenes of court life and of national legends, or else of celebrated women and men, especially warriors, poets, etc. The finest articles of this kind were formerly made in Kiyoto. Another class of children's toys made in this town, consist of excellent imitations of animals, the hair or the feathers of which are most skilfully represented by hemp and silk threads. Pictures are made by pasting pieces of silk, etc., cut out in such a way, as to represent personages in full dress, insects, or flowers, on a sheet of paper, etc. Occasionally, these pictures display a great deal of humorous ingenuity.

Other branches of the Kiyoto industry consist in the manufacture of artificial flowers, hair-pins and various ornaments for coiffures. Thin metal, silk-cords, and gilt or silvered paper are the principal materials used for this purpose. The most costly ornaments worn in the hair are made of light colored tortoise shell. In manufacturing these "objets de luxe," the white spotless parts are cut out of the rough tortoise shell, and by means of warming, pressing and gluing with the white of egg, they are shaped into hair-pins of all kinds, and mostly into those four cornered pins, 8 to 10 inches long, which are worn horizontally through the chignon. These pins, when of a light yellowish color, and of great transparency and brilliancy, are extremely expensive, as a large amount of rough tortoise shell has to be cut up in order to obtain the necessary quantity of raw material, and shells of the required quality are scarce. The brown colored tortoise shell is used for combs, small trays, fruit baskets, cigar holders and similar articles, and is generally ornamented with gilt lacquer paintings.

One of the necessities of life in Japan consists of the fan, of which there are two kinds, namely, the folding and the non-folding fan, both of which are well-known in America and Europe.

The former is a Japanese invention, made in the reign of the Emperor Tenji (668-672 A.D.) by a native of Tamba, to the West of Kiyoto, who is said to have taken the wings of the bat called *kawa-hori* for his model; this name was also applied to the fan. The materials used at first consisted of thin boards of the wood of "Chamaecyparis obtusa Endl." called *Hi-no-ki* in Japanese; it is for this reason that these fans are called "Hi-oogi." The boards were 25 in number, and united by strings in such a way as to be easily folded. That this invention was afterwards introduced into China from Japan is stated in Chinese books.

Bamboo now forms a material very handy for the cheaper kinds, especially for the non-folding fans (*Uchiwa*) which are mostly made in the province of Yamato. Folding fans (*Ogi*) are chiefly made in Fushimi, between Osaka and Kiyoto, also in the province of Owari, and some of better kinds in Kiyoto and Tokio. The process of manufacture being divided into many manipulations, gives occupation to a large number of women and children, who do the work at home and deliver it to the finishers. The materials used for the bars consist of polished bamboo, and other fine woods, tortoise and ivory, with gilt lacquer paintings, incrustedations

of colored ivory, corals and mother of pearl shell, etc. The paper is either decorated with paintings in all the different styles of Japanese art, or else brightly colored and sprinkled over with silver and gold leaves. These fans are manufactured of all possible qualities and prices, the richest and largest being used for ceremonial dances, where they form accessories of great importance.

The umbrella is another article of necessity, which would certainly neither have been manufactured in such large quantities, nor at so cheap a rate, were it not for the possession of that most useful plant, the bamboo. The bars are of split bamboo, and the cover is made of strong paper, painted with oil named "Ye-no-Abura," and a peculiar glue prepared from the fern-root and the sap of unripe persimmons, called "Shibu."

Very neat articles are also made of ivory and ornamented with incrustations and lacquer paintings; amongst the ivory carvings, the so-called "Netsuke" (see class 405) deserve special attention as specimens of Japanese art.

For the manufacture of lacquered objects, reference is made to the notes on class 217, and to the special pamphlet on this subject.

Many of the articles belonging to class 254 are well known in foreign markets, and Japanese workmen have already made great attempts to modify their productions, or to create new ones suitable to foreign manners and customs.

CLASS 255 —FANCY LEATHER WORK, ETC.

The soft deer-skins, with printed or rather dyed patterns, form a production peculiar to Japan, the process of dyeing being very much the same as that employed for cotton-goods described under the head of class 232. This is by no means a new industry, as similar skins were used by the hunters and warriors of olden times for clothing and for quilting certain parts of their armor, also by tradesmen for making tobacco pouches, etc., and lately also for travelling equipments. This sort of leather is especially well prepared in Tokio.

Another article of this class is the colored and pressed leather, with gilded or bronzed patterns, which is used for paper boxes and toilet-cases. It is chiefly manufactured in Tokio. The pattern is engraved on bronze plates, and the leather forced into this mould by beating.

An imitation made of paper (see class 264) is used for a great many articles in the place of leather.

PAPER, BLANK BOOKS, ETC.

CLASSES 259-260.—WRITING AND PRINTING PAPER.

The manufacture of paper, together with the tree yielding the best raw material, was introduced in the reign of the empress Suiko (593-629 A. D.) by the Corean priest Donchio, and since that time this industry has been greatly extended. The qualities, for which Japanese paper is noted, are due to the excel-

lent materials, chiefly obtained from plants, which are specially cultivated for the manufacture of paper and for no other purpose. The most important plant of this kind is the Kodzu (*Broussonetia papyrifera*, Sieb.), of which there are several varieties in accordance with climate, soil and cultivation; (the Kaji or *Broussonetia Kaji-no-ki* S. is but seldom used now) then the "Gampi" (*Wickstroemia canescens*, Meisn., or *Passerina Gampi*, S. et Z.), the *Mitsumata* (*Edgeworthia papyrifera*, S. et Z.), the Kuwa or mulberry tree (*Morus alba*), the Karasz-Sugi, a kind of *Cryptomeria*, the Hi-no-ki (*Chamaecyparis obtusa*), a sort of wild cherry tree (*Pseudo cerasus*), the Kawa yanagi (*Salix japonica*, Th.), the Hanzi (*Lespedeza cyrtobotria*, Miq.), the Niga-ki (*Picrasma ailanthoides*, Planch.). The bark of all these shrubs and trees is used. Bamboo has been and is still used for paper-making, but only to a very small extent; paper of this kind is manufactured in the province of Chikuzen, on the island of Kiushiu, from young bamboo-stalks, which are cut before the leaves are out. The pulp is mixed with a certain percentage of the Kodzu fibre. The paper called Chikushi, notwithstanding that the translation of this word is bamboo paper, is not made of bamboo; the name only has been borrowed from China. Cotton rags are used in those new paper manufactories which have been established lately in Tokio and elsewhere, and provided with foreign machinery.

The principle of the preparation of the fibre is always the same, and it will be sufficient to give a short description of the manner in which the chief material, the Kodzu, is prepared. The *Broussonetia papyrifera* is cultivated everywhere in Japan, but especially in Satsuma and Chikugo on the Island of Kiushiu, in Awa and Tosa upon the Island of Shikoku, and in the western provinces of central Nippon. The tree or rather shrub will not exist in damp soil, and is therefore cultivated by preference on the southern slope of the hills. The reproduction of the tree is effected by cutting the root into pieces of about one decimetre in length, which are thereupon put into the ground, and when they begin to sprout, are set out at regular intervals, generally along the borders of the fields, or upon newly cleared ground. After a lapse of two or three years, the annual cutting of the branches, near the soil, begins towards the end of November, and is done in such a manner as to make a clean cut, facing the south. The branches, of which there are always a certain number shooting up from the root, are from 7 to 10 feet in height. These are made into bunches, from 3 to 4 feet in length, then steamed, so as to loosen the bark, which is thereupon stripped off. After having been washed and dried, the bark is again soaked in water and scraped with a knife to take off the dark outer skin, which is used for inferior kinds of paper. The cleaned bast is carefully washed in a stream of water, repeatedly kneaded and rinsed, and bleached in the sun until it gets sufficiently white, after which it is boiled in a lye prepared from ashes, chiefly buckwheat-ashes, in order to remove the gummy and resinous substances. The fibres can now be easily separated; and the hard knots having been cut off, the paper makers transform the fibres into

paper pulp, by beating them with wooden mallets. This pulp is mixed in vats with the necessary quantity of water, to which is added a milky substance, prepared from rice flower and the gummy infusion of the bark of the Nori no-ki (*Hydrangea paniculata*, Sieb.), or of the root of the "Tororo" (*Hibiscus manihot*). The couches on which the paper sheets are produced, are made of bamboo, split into very thin sticks and united in parallel lines by silk or hemp threads, so as to form a kind of small mat. This is laid upon a wooden frame, giving it the shape of a low box, with a sieve bottom. This apparatus is then dipped into the vat, raised again and shaken, so as to spread out the pulp equally, after which the vatman first removes the cover, then the bamboo couch with the sheet of paper, and in returning it, lays the paper sheet upon the others, which he has already made, keeping them separate by laying two pieces of straw upon the top of the finished sheets, or else not separating them at all. When a sufficient number of sheets are ready, and the water has partly run off, the whole post is placed under a press for a few hours, so as to remove the water. The moist sheets are then spread out with a brush upon smooth boards, and allowed to dry. Generally the sheets are only about two feet in length; but sometimes, very large sheets, 10 feet long, are produced and used—for instance, to make an article similar to foreign oil cloth.

The processes used for the most important of the paper fibres, remain very much the same for all the others. The Gampi plant yields a fibre of particular beauty and fineness, used mostly for the best writing and printing paper; the latter being of great thinness, and possessing a brilliant surface, which takes the ink very well. The Gampi, being a southern plant, is not able to exist in such rough climates as the Kodzu.

Since the machinery used for paper making is exceedingly simple and requires but a small outlay of money, it is only natural that paper (at least, as far as the commoner kinds of paper are concerned) should be extensively manufactured by the farmers, at times when the fields do not demand all the attention. Only the better kinds of paper are manufactured in special workshops, similar implements, on a larger scale, being used for their production. There are hundreds of various kinds of paper, differing in material, in color, in size, in thickness, etc., and distinguished by names, which designate either the ultimate use made of the paper or the place of manufacture. Certain kinds of paper are very prettily ornamented, with bright colors, gold and silver powderings, or light sketches, and are used either for notes, enclosing presents, or for writing ceremonial letters. Envelopes have now become articles of greater importance than they were formerly.

The Japanese paper is not only well adapted for printing, but also for the writing of Chinese characters, for which operation the pigment known by the name of Chinese Ink is used with a brush, the pen being dispensed with as entirely unsuitable for the purpose. The brush moves very easily, and the paper

absorbs the ink almost immediately, without allowing it to spread in the least. Printing is done by merely rubbing the back of a sheet of paper laid on the printing block, with a flat rubber covered with one of the smooth dried bud scales which, like a sheath, surround the lower joints of a full grown bamboo stem. Here, again, the absorbing power of the paper fibres is quite essential for the success of the process of printing. The extraordinary strength, due not only to quality, but also to the length of the fibres, which do not undergo the violent manipulations of the Dutch stuff or rag-engine, makes the paper suitable also for many other purposes besides writing and printing, for which reference should be made to the following classes.

CLASSES 261-262.—BLANK BOOKS, BOOKBINDING, CARDBOARD ETC.

Blank books and account books are not only used by most merchants and private individuals, but also in all Government and other offices. The peculiarity of the Japanese books consists in their being almost all composed of folded sheets, the fold appearing on the outer edge of the book. This is undoubtedly the most practical plan, being perfectly adapted to the soft nature and great thinness of the paper, as well as to the very simple process of printing, in which a single sheet of two pages is printed at the time on the one side only. Latterly, the foreign style of ruling and binding has been tried. Cardboard is made by pasting several sheets of ordinary paper together. The Japanese albums, opening on both sides, are fine specimens of bookbinding, being made of good strong paper and covered with fine silk brocades.

CLASS 264.—WALL PAPERS, COLORED PAPERS, ETC.

Paper is extensively used in Japanese houses, as a substitute for glass in the windows and sliding doors, and possesses not only the advantage of an immunity from breakage by the frequent earthquakes, but also occasions only a small loss when the house burns down, which happens often enough. Whatever may be its drawbacks, the use of paper for the above purpose is intimately connected with the system of house building in Japan; and it will be long before it is entirely abandoned.

Wall papers are used in all the houses, and are manufactured, not in rolls, but in small sheets ornamented with all kinds of designs printed from wooden blocks, on which the pattern has been cut in relief. The colors having been mixed with some thickening paste, are applied to the block, either by means of a brush or by tamping; after which the paper sheet is laid on the block and rubbed in the manner described in Classes 259-60, with a flat rubber lined with the smooth

bud-scales of bamboo, and used like a printer's ball. Very fine white mica powder is applied to the wall paper, and produces a metallic lustre resembling silver.

The crape-paper, which is a most perfect imitation of the real crape, is made by a very ingenious and most simple process. In the first place, that which may be called the matrix-paper, is prepared by laying a moistened sheet of strong paper on a wooden board cut with fine grooves, running either parallel or crossing one another at very small angles, and by beating it with hard brushes, so as to force it into these grooves. It is then painted over with the frequently mentioned "shibu," in consequence of which operation the paper becomes so elastic, that when let go after having been stretched out, it refolds by itself. For the production of crape, several sheets of thin moistened paper are laid, alternately with sheets of the above mentioned matrix-paper, one upon the other. The package is then wound on to a round piece of wood, and pressed several times with a strong lever, as if it were to be stripped off from this piece of wood. By means of this operation, the soft and moistened paper is forced into the folds of the matrix, and consequently folded in a similar manner. By repeating this manipulation 10 or 12 times, each time unrolling it in order to change the position of the paper between the sheets of matrix-paper, and by winding it again on the piece of wood, the paper becomes gradually folded in all directions, the intersecting points of all these folds producing the craped surface. Naturally, this process causes the paper to shrink considerably. This kind of craping is done with printed pictures, and also with colored papers, which are used for coiffures.

The paper imitations of leather are made in the same manner, but of stronger paper. After it has been craped, it is beaten with hard brushes into the moulds which produce the relief patterns; and these designs are afterwards painted as required with the help of "shibu," or the "Ye-no-abura," and lacquer (see Classes 201 and 202).

Paper is also often used as a substitute for cloth, for umbrellas, rain-coats, etc., and even for dress cloth. "Shibu," and the "Ye-no-abura," are the means employed for rendering the paper waterproof. This cloth is generally made of paper alone, by beating it to make it soft, and impregnating it with gummy substances, to make it more resistant to the action of water. Another kind of cloth, called "shifu," consists of silk warp and paper woof. The paper is cut into fine strips twisted together into threads, and spooled for weaving. Paper strings, of great regularity, great strength and prettily colored, are made in a similar manner, and were formerly used in large quantities for tying up the hair. They are now only used for tying presents and other small parcels.

The use of gilt paper for brocades has already been mentioned in Class 246.

MILITARY AND NAVAL ARMAMENTS, ETC.**CLASS 268.—SWORDS.**

Until quite lately the sword has always been considered as the distinguished mark of gentle birth; however, the wearing of swords has been entirely forbidden by a late decree. According to the old legends the sword is of very ancient, and even Divine origin, as it was handed by Amateraszu-on-kami, the heavenly ancestress of the actual dynasty, to one of her descendants, together with a mirror and a rounded stone, similar to those which in former times were worn as ornaments and amulets. These three celestial gifts were considered to be the principal treasures of the Empire, not only on account of their divine origin, but also as being symbols of the elevated principles to be borne in mind by the rulers of this country. "When," said the divine Amateraszu, "thou art in want of contemplating the spirit of thy ancestors in all purity, and of distinguishing clearly the good and the bad, then look in this mirror. Thy country thou shalt govern with a mildness comparable to the soft rounding of this stone. And when there are any people disturbing the peace of thy subjects, chastise them with this sword, and force them back into submission to thy laws."

This sword is said to have been placed, together with the two other treasures, in the Shintoo Temple of Ise, by the Emperor Sujin, who reigned from 97—30 B.D., but one of his successors, the son of the Emperor Keiko (71—131 A.D.) removed it to the temple of Atsuta, Owari, where it still remains, but is never shown.

Other almost equally ancient swords are preserved in various places, but sword making in Japan is of comparatively much more recent origin. There were two ways of manufacturing them. Either a hammered sheet of steel was welded round a properly shaped bar of soft iron, so that the latter should form the nucleus, and the steel the outer envelope of the blade, or else a sheet of soft iron was welded round a bar of steel. In hardening and tempering it, the sword maker would cover the blade with clay, leaving only the edge exposed when putting it into fire. The celebrated sword makers, and there have been many of them, had their own special marks, and numerous stories are related about the keenness of famous blades, which were often called by special names; they are still considered very valuable, and are not easily obtained. As to the ordinary shape of the swords, there were six or seven different kinds in former times; the custom of wearing two swords, a long and a short one, which was still in existence when the country was opened up to foreigners, only dates from the year 1682.

The exteriors of the good swords in most cases form very valuable specimens of workmanship. The scabbard, generally made of magnolia wood, is covered with the finest lacquer; the guard and the ornaments of the scabbard or hilt

consist frequently of very fine repoussé work of various alloys, inlaid with gold and silver. Often the guard is of iron with gold ornaments, and is very skilfully forged to produce relief figures on both sides. In order to give a firmer hold to the hand, the hilt is sheathed with shagreen, and silk cords are bound cross-wise round it.

Latterly this industry, which was chiefly pursued in the province of Bizen, has undergone considerable changes, and the sword makers have mostly taken to forging foreign style of arms for the soldiery.

MEDICINE, SURGERY, PROTHESES.

CLASS 275—276.—INSTRUMENTS FOR PHYSICAL DIAGNOSES, ETC., SURGICAL INSTRUMENTS.

With the assistance of Dutch physicians the study of foreign medical science had been carried on in Nagasaki for more than 20 years. In 1872 however, a medical college was established in Tokio, which has now over 500 pupils divided into the preparatory school and the college; the lectures are delivered in German. Under these circumstances, Japanese workmen have exerted themselves to produce all the various instruments and implements used by physicians and surgeons.

CLASS 278.

Vehicles for the transportation of the wounded have been constructed by order of the war department, in such a manner as to answer the requirements as well as the conditions of roads and means of transport in the country will permit.

METALLIC PRODUCTS.

CLASS 283.—METAL HOLLOW-WARE, ORNAMENTAL CASTINGS.

The names and compositions of the various copper alloys have already been mentioned in the notes on Class 114.

The Japanese word corresponding to the English "bronze" is "karakane," which means "Chinese metal," whereas the brass alloys are called "shin-chu." The spelter used for the latter is imported.

The industry of bronze-casting is of very ancient origin; at first foreign metal, imported either from China or Corea, must have been used, as Japanese copper has only been produced since the beginning of the 8th century; by that time, however, the industry of bronze-casting had already reached a certain state of perfection. This is shown by the fact that the priest Giyoki, the introducer of the potter's wheel, who lived about this time, proposed the erection of a monster bronze statue of Buddha, representing the god in the usual sitting position of serene contemplation. This proposal was accepted and carried into

effect by order of the Emperor Shomu (724—749 A.D.). There were formerly three of these statues in Japan, each about fifty feet in height; the most ancient one in Nara, built 743—752, was in the first place greatly damaged by an earthquake, which caused the head to fall off, and was afterwards destroyed by a fire which broke out in the surrounding temple, so that it had to be entirely rebuilt towards the end of the 12th century. This statue still exists in Nara, in the interior of a wooden building of remarkable construction. A second one of similar proportions existed in Kiyoto, but was destroyed by fire. The third one is the well-known Daibutsu, of Kamakura, and was built in the 13th century with an alloy containing a small percentage of gold. Other specimens of large bronze-castings are the famous bells of Nara, Kiyoto, Nikko, Shiba in Tokio, and others, which have an average height of 15 feet, and more than 10 feet in diameter.

Statues of all sizes, bells, vases, water-basins, candle-sticks, incense-burners, lanterns, etc., have been manufactured in large quantities for temples and their approaches. Portrait-statues, like the monuments erected in foreign countries to honor the memory of celebrated men, have never been made in Japan. As articles for household uses, we may mention fire-pots, water-pots, flower-vases and basins in which miniature gardens are made, perfume-burners, pencil-cases, small water-pots of fanciful shapes for writing-boxes, paper-weights, and small figures representing divinities. These bronze castings are either made in the simple and severe style of the old celebrated Chinese bronzes, or else are specimens of the peculiar character of Japanese art, which chooses its subjects from natural life, either combining them with lively scenes showing a great deal of humor together with the most minute copying of nature, or else using them to produce some artistical effect, sometimes in a somewhat capricious way, quite unexpected to the beholder. Occasionally the artist takes his subjects from Chinese and Japanese mythology, and produces all sorts of legendary animals such as the dragon, the stork, the tortoise, etc., which are largely represented on the candle-sticks and other castings used in temples or in the domestic chapels. The bronze utensils of these latter are generally composed of 5 pieces—2 flower-vases, 2 candle-sticks and one incense-burner.

The bronze is cast in clay moulds formed upon models made of a mixture of wax and resin, which is melted out from the finished mould previous to pouring the metal in. The artist who makes the model, generally does the casting himself, and in most cases the workshops consist only of the master's family and two or three assistants. The melting furnaces are of exceedingly small dimensions, and generally made of an iron kettle lined with clay. After casting, the pattern is carefully corrected and worked out by chiseling, but the best bronze casters prepare the model, the mould and the alloy in such a way as to produce casting which need no further correcting or finishing. In some cases also, the whole pattern is produced merely with the chisel working upon a smooth surface; this,

for instance, is frequently done in the provinces of Kaga and Yechiu, which are very important centres of the bronze industry. The bronzing of the pieces is done in many different ways, each manufacturer having his own particular process, which he modifies according to the composition of the alloy and the color he wishes to produce. The chemicals used for this purpose are very few in number, and limited to vinegar, copper sulphate and verdigris as the principal substances; other materials used less frequently, consist of iron sulphate, red oxide of iron and lacquer. It may be added as a peculiarity, that an infusion of "Eryanthus tinctorius" is also made use of in the bronzing process.

The ornamentation of bronze castings is not only produced by relief patterns moulded or chiseled, but also by inlaying the objects with gold, silver or with a different alloy. This kind of workmanship is called "Zogan," and is principally carried on in the provinces of Kaga and Yechiu. The process by which the inlaid work is effected, differs according to the nature of the material on which it is produced. Sometimes the design is hollowed out to a certain depth with a graver or chisel, and the ornamenting metal, silver, gold, etc., generally in the shape of threads, is laid into the hollow spaces and hammered over, should the alloy be soft enough; the edges of these grooves are first slightly driven up, so that when the silver or gold has been laid in, they can be easily hammered down again, so as to prevent the inlaid metal from getting loose. Or else the surface is merely covered in the required places with a narrow network of lines by means of filing, and the thin gold or silver-leaf fastened on to this rough surface by hammering. This last process is the one used mostly for inlaid iron-work. It is also said that the design is often produced by a process very similar to that of the so-called "Niello;" only instead of the black sulphuretted silver and copper, a more easily fusible alloy is used. Inlaid work of the above kind is principally made in Kaga and Yechiu, at Kanasawa and Takaoko, where the alloy used for the bronze casting is mostly composed of copper, tin, zinc and lead.

In addition to the castings the repoussé work should be mentioned, by which mostly small metallic ornaments for swords, tobacco pouches, etc., and also larger pieces, such as tea-pots, scent-burners, vases, etc., are produced; the inlaying of this kind of ware is sometimes of extraordinary delicacy and beauty. The dark blue color shown by a great number of smaller pieces, is that of the Shaku-do, composed of copper and 3 or 4 per cent. of gold.

Finally, attention should be called to the so-called "Moku-me," a word which might be rendered by "veins of the wood." The metal-work designated by this name presents a sort of damask pattern composed of variously colored metals, chiefly white silver, red copper, and a dark blue alloy. Pieces of this very difficult sort of workmanship are produced by overlaying and soldering together a certain number of plates of the said metals or alloys, by hammering, kneading, resoldering, filling up the hollow spaces with new metal, and repeating

these operations many times; finally, when stretched out into a thin sheet, this composition shows the aforesaid pattern all composed of veins of the different metals that have been made use of.

There is no doubt but that the bronze castings, as well as the chiseled or inlaid ware, belong to the most remarkable creations of Japanese industry. Whatever may be the judgment concerning the model and the patterns, it will be admitted that the workmanship, the patience and the skill by which the most complicated forms are produced, as well as the art of combining variously colored metals, merit the highest praise and attention of the connoisseur.

FABRICS OF VEGETABLE, ANIMAL OR MINERAL MATERIALS.

CLASS 288.—FLAGS, INSIGNIA, EMBLEMS.

The emblem of the Japanese Empire consists of the sun represented by a golden ball on a red ground for the imperial standard, and by a red ball on a white ground for the national flag. In ancient times the flags had a double crest, the sun and crescent moon, the shape of the flag being somewhat similar to a pennant, viz., long and narrow. The Shioguns, of the Ashikaga family, introduced the long vertical flags some 400 years ago, which are still used for holidays and for adorning the houses and temples. Under the Shioguns of the Tokugawa family, the emblem of the sun alone figured on the flag, and has now also been adopted for the new flags of the different departments.

CLASS 289.—WOODEN AND BASKET WARE, PAPIER MACHE.

Good specimens of wood work, comprising also wooden inlaid work, are exhibited in Class 217, and will give a sufficient idea of the national workmanship.

For basket work, dyed straw from wheat, the bast of the "Wisteria chinensis," split cane and various colored bamboo are used. This latter material has the advantage of being easily split even into very thin round or flat strips, presenting a very brilliant surface and possessing great durability. It is used for large and small work of all kinds, and the manufacture of barrel hoops and basket ware forms one of the most important applications of this useful plant. As a specimen of highly artistic workmanship, attention may be called to the exhibited model of a Japanese country-house, all made of fine strips of bamboo, the roof, the sliding doors, windows, etc., all showing various patterns. Each room is constructed to lodge some chirping insects, such as grasshoppers and others which are often kept in small cages for amusement.

The paper ware, called "Ikkanbari," from the name of the inventor, is not exactly the same as the European "papier-maché," but is rather card-board work, produced by numerous layers of thin paper, and hence of great solidity.

and elasticity. The very soft and flexible Japanese paper is placed on wooden moulds, the shape of which it easily assumes by being moistened and tamped; the different layers are pasted together to the required thickness with a peculiar kind of glue prepared from fern roots and the sap of unripe persimmons. By these means articles are produced which combine lightness and solidity; and in former times certain parts of the armor and helmets were made in this manner. Cartoon work of this kind may be afterwards lacquered and painted.

DEPARTMENT III.

EDUCATION AND SCIENCE.

(See the Special Report of the Department for Public Instruction.)

INSTITUTIONS AND ORGANIZATIONS.

CLASS 312.—MUSEUMS, COLLECTIONS, ETC.

Towards the end of 1873, a Museum was organized in Tokio, comprising six departments, viz. : The industrial department, the department of art and art applied to industry, a collection of scientific and educational apparatus, a museum of natural history, an agricultural department, and finally a historical and ethnological museum. These collections were greatly augmented at the time of the Vienna exhibition by donations and purchases. Unfortunately a large number of the most valuable objects were lost in the steamer "Nile," which foundered off the coast of Japan in 1874. Several workshops are connected with this museum, of which the most important consist of an atelier for modeling in plaster and clay, and a small silk factory, fitted with a complete collection of improved machinery for the reeling, spinning, weaving, and dyeing of the silk, together with all the testing apparatus. It is further intended to organize a school of design, to be controlled by this museum.

SCIENTIFIC AND PHILOSOPHICAL INSTRUMENTS.

CLASS 322.—WEIGHTS, MEASURES, ETC.

The decimal system for weights and measures was adopted in Japan many centuries ago from the Chinese. The unity of the weight is called the "mome," or by the modern name of "sen," which is the same as the Chinese "mace," and according to the official mint-regulations equal to 3 grammes

756521. This unity is divided into 10-100-1000 parts, etc., whereas the "Kuwan-me," is the highest unity, and equal to 1000 mome, or 3 kilos, 756521. For various kinds of goods, the "Kin," called "Catty" by foreigners, is also used, which is generally equal to 160 mome, or 601 grammes, 04, (or very nearly $1\frac{1}{3}$ lbs. English); it varies, however, according to the nature of the goods and locality. The scales used are the so-called roman balances.

The Japanese "shaku" is about the same as the English foot. The department of public surveys has decided to fix its length according to the proportion of 1 metre = 3 shaku 3 sun, which would make this new shaku almost equal to the old one. The shaku is divided into 10 sun, 1 sun into 10 bu, and so on; in surveying a length of 10 feet = 1 djo is used. The instruments for making graduated scales on wood, bamboo, ivory, metal, are no others but a brass standard, a ruler and a graver. Dividing instruments have only been introduced within the last few years.

The measures of capacity for cereals, liquids, etc., are the Koku = 10 Jo = 100 Sho = 1000 Go = 6482690 Japanese cubic lines, or 180 litres, 39; and are in the shape of square wooden boxes, with a diagonal iron rod stretched across the top, the upper surface of which is on a plane with the rim of the box.

A special committee, appointed by the Treasury department, has now under its consideration the question of the definite regulation of the national system of weights and measures and of its comparison with the European systems.

ENGINEERING, ARCHITECTURE, ETC.

CLASS 330.—CIVIL ENGINEERING, ETC.

Of all the various branches of civil engineering, the art of arresting and controlling the flow of water is a science which has been to a certain extent forced upon the Japanese by the natural conditions of the country. As Japan is a mountainous country, of considerable length but of comparatively very little breadth, the rivers are generally short, rapid and shallow, carrying with them a great deal of gravel, so that navigable rivers are scarce, and can only be used by very small craft. On the other hand they are subject to sudden rises, which cause inundations, and their rapid current is liable to destroy the banks and to cover good ground with sterile sand. These, however, do not form the only reasons for taking measures to control the rivers; the system of agriculture, in which "paddy" fields take so large a place, also necessitates numerous reservoirs and canals for the irrigation of the soil. All these circumstances explain the reason why in Japan the principal works of hydraulic engineering have the protection of the river banks and the irrigation of the fields in view.

Neither time nor space can be afforded to describe the various dykes and breakwaters, for the construction of which wooden piles and irregularly shaped stones are used, without either cement or hydraulic mortar. It may, however,

be of interest to mention the important place which the bamboo takes in these constructions.

A kind of strong cylindrical bag, often eight yards and more in length is made of split bamboo, with wide meshes, and is then filled up with big stones. A certain number of these bags arranged on a wooden grating, form the foundation of the breakwaters or dykes. When the current is very strong, the ends of the bags are allowed to pass the gratings and to hang down into the sandy bed of the river ; gradually they sink deeper and deeper, and finally, being entirely buried in the mud, form a solid mooring. The object of the bags is to keep the stones together, till all the interstices are filled up with sand and mud, when the construction is transformed into a solid mole. The bamboo is said to be of great durability ; stems of this tree are also used for weirs and the temporary surroundings of breakwaters. The exterior parts of dykes are often covered with grass matting, so as to prevent their being washed away. For further details, reference should be made to the book exhibited and published by the Board for the construction of public roads and bridges, which contains a great number of diagrams.

Another kind of hydraulic work for the purpose of the irrigation of the land, was inaugurated by the Emperor Sujin, in the year 32 B.D. The latter, after a great drought and consequent famine in one of the provinces, ordered the construction of a dyke in the mountains, closing up one end of the ravine which formed the bed of a small rivulet ; the water accumulating behind the dyke was only used when required for the irrigation of the "paddy" fields. Reservoirs of this kind are now to be met with in many parts of Japan, and sometimes resemble small lakes. Irrigating canals are to be found all over the country, and even those whose level is considerably above the surrounding country, can be followed for miles, as, for instance, in the province of Yamato.

In conclusion mention must be made of one of the most remarkable pieces of engineering, viz. : the two great aqueducts which supply a large part of the city of Tokio (Yedo) with drinking water, and of which a plan is exhibited, showing the distribution of the water over the city. Both were completed in the beginning of the 17th century, the shorter one in 1623, the longer one in 1653. The latter, a canal 26 English miles in length, starts from the river Tamagawa, near the village Ha-mura, district of Tama, in the department of Kanagawa, and province of Musashi, its connection with the river being regulated by a lock. The water is brought through this open canal to Yotsya, one of the suburbs of Tokio, in which place a second lock, 16 feet high and 6 feet wide, terminates the open canal, and the underground works begin. The main conduit is built of stone, and extends through the whole town, ending near the present railway station. The branches are square channels, made of wooden beams and planks, and of various sizes, the largest having a section of 4 feet 5 inches by 4 feet 5 inches. In very damp ground the Mats-no-ki (*Pinus densiflora*, S. et Z.) is used, which lasts from

30 to 40 years, without any special means being taken for its preservation; it is even stated that in some instances it has remained sound for over 70 years. In places, where the wood is more exposed to the influences of the atmosphere, to a continual change of dry and wet, warm and cold weather, the Hi-no-ki (*Chamaecyparis obtusa*, Endl.) is used. This wood, however, although much stronger, does not last more than 19 to 20 years. The second aqueduct starts from a small lake called I-no kashira-ike, which has an area of 529 French ares (equal to 13 English acres), and lies near the village of Mure, district of Tama-gori, in the department of Kanagawa. The canal, 11 English miles in length, enters Tokio by the Ko-ishi-kawa suburb. The two aqueducts together feed 5805 wells, which furnish about three-tenths of the well-water used in the city of Tokio. The yearly tax, to be paid during the ensuing 5 years has been increased to 4 dollars and 2 cents for each well, owing to the extensive repairs which have become necessary, but will be lessened after the expiration of this period. The Imperial household pays 2 per cent. of the annual cost. Chemical analysis tends to show that the water is of excellent quality at the place where it enters the city, and the test with potassium permanganate does not indicate the slightest trace of organic impurities.

PHYSICAL, SOCIAL, AND MORAL CONDITION OF MAN.

CLASS 344.—MONEY, MINTS, AND COINING.

Silver coins, stamped with a flower, are reported to have been in use in the earliest centuries A.D., after intercourse had been established with Corea, and through Corea with China; and there is authentic information to the effect that they were in circulation in the 5th century. But they were undoubtedly coined of foreign metal, as silver was only discovered in Japan in 675 A.D., and gold in 747 A.D. The first piece of money made of native metal were copper coins; they were manufactured in the beginning of the 8th century, during the period called "Wa-Do" (see class 112), and were marked with the four characters; "Wa-Do-Kai-Chin," which signify, "Japanese copper, a newly discovered remarkable thing." Shortly after this time, viz., in the year 760 A.D., the Emperor Sunnin established a more elaborate money system, consisting of gold, silver, and copper coins. The gold coin weighed 5 mome, and bore the Chinese characters, "Kai-ki-sho-ho," or "newly made fine precious thing." The silver coins were equal in value to one-tenth of the gold coins, and were marked with the characters, "Tai-hei-gem-po," or "peaceful time's original precious thing." Finally the copper coins, equal in value to one-tenth of the silver coins, were marked "Man-nen-tsuh-ho," or "Ten thousand years (everlasting) currency." In the year 1601, the Shogun Hide-yoshi or Taiko-sama, introduced large gold coins of an oval shape, and from that time the coinage remained in the hands of the

Shoguns, who frequently altered the weight as well as the composition of the various coins.

The national coinage at the present day is supplied by the Imperial mint, established in Osaka, and provided with a complete set of all the necessary implements. The unity is the gold yen, weighing 25.71 grains troy, fineness 0.900; and the gold coins are pieces of 1, 2, 5, 10, and 20 yens. The yen is divided into 100 sen; the sub-divisions are silver coins of 5, 10, 20, 50 sen, the latter weighing 193 grains troy, of 0.800 in fineness; and copper coins of 2 and 1 sen, 5 Rin and 1 Rin, equal to one-tenth of a sen. In addition to this currency, a silver trade dollar is issued, weighing 420 grains troy, of 0.900 in fineness.

From the 2d of August, 1871, to the 31st of March, 1875, the Imperial mint issued 10,094,885 gold pieces, representing a value of 49,741,783 yens; 66,427,895 silver coins, equal in value to 14,631,600 yens 65, and 75,800,720 copper coins, amounting in value to 633,250 yens 05.

DEPARTMENT IV.

FINE ARTS.

CLASSES 400—413.—SCULPTURE AND PAINTING.

Japanese art has frequently proved a favorite subject of discussion amongst the art critics of foreign countries, and more especially so latterly, since Japan has established commercial relations with other nations. Although many of the foreign museums have since a long time been in possession of rich collections of Japanese products, yet it cannot be denied, that these collections were incomplete as regards several branches of industrial art, well worthy of the connoisseur's attention. This is not to be wondered at, as foreign trade was for a long time confined to the port of Nagasaki, a place, which, excepting for the fact of its being the market for the sale of porcelain manufactured in the neighboring province of Hizen, has never been one of the centres either of manufactures or of industrial art. Moreover, certain branches of art are comparatively of modern origin, and were very likely unknown so far south as Nagasaki; as for instance, the manufacture of the fine inlaid bronzes of Takaoka, in Yechiu, which only dates from the end of the 18th century. Since the opening of the country, however, foreigners have been able to visit the various cities, the centres of industry, and the seats of Japanese civilization; and it may be safely asserted, that only since then, they have been able to obtain a more complete and exact knowledge of all the various branches of Japanese art. The extensive export of all kinds of

objects pertaining to industrial art, and the fact, which everybody noticed during the previous exhibitions, viz., that the elements of Japanese art have been to a great extent adapted to and used for modern European industry; all tend to show that Japan not only possesses a certain artistic power peculiar to herself, but also, that she may be full of hope for the further development of her industries.

Of course, it is not for us to proclaim our own national merits, and it must be left entirely to foreign critics and to the judges of the exhibition, to decide if the Japanese art of to-day answers the expectations of connoisseurs, or whether it has to any extent deteriorated or taken the wrong direction. However, a few observations on its general features may be of sufficient interest to find a place in these pages.

It has been stated in the notes on the department of manufactures, that science and industry owe their birth to Corea and China; that the origin of art also is due to similar sources, is clearly shown by the earliest paintings, castings and sculptures, as well as by the ornamentation made use of by the artists; and there is not the slightest question as to the presence of Indian influence and Indian types in certain religious paintings, chiefly relating to Buddhism. The belief indulged in by many people, that Chinese art has never created anything else but paintings without perspective, such as those of landscapes, etc., on porcelain, is entirely incorrect. The ancient Chinese pictures are of quite a different style; sometimes they treat on historical subjects, with a highly poetical inspiration; at other times they depict the intellectual enjoyments of the philosopher, surrounded by natural and artistic objects, arranged in accordance with all the laws of harmony; sometimes, also, they reproduce nature with all the delicacy of sentiment of the true artist. Old Chinese flower-paintings present some of the finest examples of this branch of art, and are highly valued by Japanese. Even in the beginning of this century, a celebrated Chinese painter was summoned to Japan by one of the Shoguns, in order to execute some work for him, and his name is still well known amongst the Japanese artists. The primary instruction which the Japanese obtained from their neighbors, was certainly one of great artistic value. But, similar to the industries, which, although introduced from Corea and China, were nevertheless improved upon, and in the end entirely transformed, art also soon changed its ways, and acquired a national character, which at present greatly distinguishes it from the Chinese. This distinct development was only natural and forcible, since the intercourse with China and Corea was never of a steady commercial kind, but rather of an occasional scientific nature; and besides it has also been greatly influenced by the events of national history.

From the end of the 12th century to the end of the 16th, the country was continually disturbed by internal discord; wars were frequent, and but little time could be devoted to the cultivation of peaceful arts. The greater number of traditions, concerning famous warriors and their deeds, as well as the dramatic

histories of feudal life and all its violences, which are so frequently represented in printed pictures and on the stage, date from this period. It can scarcely be supposed that these representations are due to the invention of modern genius. Their mere character is sufficient to make it patent, that they have been originated at a time, when the remembrance of these sanguinary struggles was still alive, and when the minds of the people were still vibrating from the excitement of these wild scenes. Whatever may be the shortcomings of the design as far as correctness and plastic beauty are concerned, it must be acknowledged that even the ordinary and very cheap pictures of battle-scenes possess great energy of composition, enhanced still more by a brilliant coloring, corresponding to the subject. They depict the battle raging with all the passions of excited warriors, without there being anything theatrical about them; and there is nothing in these pictures that is not entirely corresponding to the situation.

The history of the country presents quite a different aspect after this period. From the beginning of the 17th century until to-day, Japan has enjoyed in continual peace, interrupted only by insignificant disturbances. This, of course, has been most favorable to the development of art, to the display of all the faculties of the people, and to the manifestations of the real national character. Science, fine arts, poetry and music have gradually become the favorite occupations of the upper classes, who encouraged industrial art by giving plenty of work to the artisans, whose finest creations date from this period. Even the great warrior Taico-sama, having quieted the country, did not disdain to devote himself to art, and one of his paintings is still preserved in the temple of Honganji in Kioto. By degrees the style of living of the gentry underwent great changes, and began to resemble the kind of life represented in another class of printed pictures. These—instead of armor-clad fighting warriors—picture ladies and noblemen in gorgeous dresses occupied in the above-mentioned pastimes, and dwelling in gaily arranged houses, surrounded with those flowers and trees which are dear to the poet. The traditions of ancient Chinese philosophy concerning the theory of harmony of nature, and likewise a natural disposition peculiar to the people, had the effect of causing a certain reverence and appreciation of the beauties of nature, a feeling which manifests itself in Japanese poetry, as well as in the care bestowed in selecting and arranging the dwellings and their surroundings, and also in the passionate love of flowers, of fine landscapes, and even of the singularities of nature. This trait of the national character has necessarily exercised a great influence on art, and by far the greater number of Japanese painters take for their model natural sceneries, such as landscapes, flowers, etc., or the dispassionate events of a peaceful life. Generally the landscapes are rendered more animate by some moving object, a ship or something else, or also by people who are represented as enjoying themselves in this scene of nature; insects or birds figure on smaller sceneries and flower paintings, giving life to the

whole. It is probably owing to this predilection for the quiet and harmonious scenes of nature, which are animated only just so far as to point out the peculiar character of the scenery, without disturbing the mind too much from the impressions made by the beauties of lifeless nature, that Japanese painters are, in most cases, inferior to foreign artists, as far as the painting of larger animals is concerned. The horse alone, as the noblest of animals, worthy to be offered to certain divinities in worshipping them, has been a frequent object for Japanese painters; such pictures are generally done only with a few vigorous strokes of the brush, sometimes with quite a remarkable correctness. On the other hand it cannot be denied that the artists are very close observers of the habits and customs of smaller animals, such as birds, fish, insects, etc., whose characteristic features are often rendered with great fidelity, together with an astonishing sobriety of the technical means for reproducing them. These pictures do not always represent nature in its brightest colors; on the contrary, many of the best painters prefer the neutral shades of cloudy weather or a misty atmosphere, which carries the eye away to inscrutable distances, and gives the artist an opportunity of showing his power and skill with the brush, in producing either tints of extraordinary vigor or graduations of imperceptible fineness. This technical skill frequently shows itself in pictures representing animal life in the water, a favorite subject for good painters. The picture on exhibition has been painted by one of the best artists, who is now more than 89 years old, and who has certainly been one of the most productive painters of Japan, being equally conversant with all the different styles of painting. Some flowers, such as the paeonia, the chrysanthemum, the lotus, the plum blossom, the cherry blossom, etc., are the particular favorites of artists; trees and shrubs, the bamboo, the pine tree and the Japanese maple, with its beautiful autumnal tints, are the most frequently represented. A peculiar style of painting is the so-called "Szumi-ye," done in Chinese ink, generally by a few strokes of the brush, but often showing a combination of powerful tints and delicate graduations, which almost produces the effect of coloration. The skilful artist makes a special point of painting these pictures in a very few minutes, in a manner quite enchanting for the looker on.

Painters of historical pictures are very scarce; their subjects are nearly always taken from the life of warriors, whose equipments give the artist an opportunity of painting the richest ornaments with microscopic minuteness and with the most brilliant colors. For larger pictures, the style is generally that of a vigorous sketch in broad outlines and a sober application of colors. The careful distribution of light and shade in the reproduction of rounded surfaces, which to a certain extent gives the painting a resemblance to sculpture, can scarcely be looked for in the works of Japanese artists; their merit lies more in the motion, than in the accuracy and plasticity of the drawing.

The representation of human life is quite in harmony with the manner in which nature is preferably pictured by Japanese artists. Their minds, of course, have been subjected to the same influences as the nation in general. A long peace, lasting for nearly three centuries, with a complete absence of anything like a struggle for life, since their wants were so few and means of subsistence so plentiful, that pauperism was entirely unknown; a beautiful nature, preserving a charming medium between the colossal and overwhelming sceneries of Alpine regions and the uniform appearance of large plains; a nature composed chiefly of small and pretty sceneries, scattered all over the landscape, and preserving part of their gay exterior even in winter time, in consequence of the great number of evergreen plants; all this has probably contributed to develop one of the principal traits of the national character, viz., a kind of harmless humor, which injures nobody, and which has found its artistic expression in the countless little sketches, mostly due to celebrated artists and known by the printed publications. Although they are mostly produced with very few strokes, merely by outlines, they generally show a great deal of life and motion, and a striking expression of the action. This preference of painting little humorous scenes may also be found in subjects of a mythological character. These often represent some extraordinary beings, rather of a comical than of a terrific appearance, and placed in situations which cause people to laugh rather than to terrify them. One of the favorite subjects of painters and sculptors is the ancient legend of the seven demi-gods, who are always represented as amusing themselves, traveling around, always engaged in some serene enjoyment of the beauties of nature, or the amenities of life, playing with children or amongst themselves; in short, representing the joyful side of the national life in all its various features.

The sculptor, like the painter, prefers to choose his subjects either from mythology or from every day life; and it must be admitted, that the very unpretentious nature of these latter subjects render their reproduction in small carvings more appropriate than by monumental work. Indeed, with the exception of the bronze and other statues used in temples, together with some well modeled wax figures, scarcely any sculpture is to be found representing the human form in life size. The most remarkable pieces of Japanese sculpture consist of wood and ivory carvings and of small figures of bronze and clay. The so-called "Netske," *i.e.*, small ivory carvings used for fastening the tobacco pouch to the girdle, are well known and much sought after by foreigners. Tokio still possesses some very skilful artists, who produce good specimens of carving.

CLASSES 420-424.—ENGRAVING AND LITHOGRAPHY.

The drawings and sketches of good painters have been frequently reproduced by printing from wood blocks, a process which was briefly described under Classes 259-260. As the colors are applied to the wood block with a brush

(in a manner similar to painting), when graduated tints are required, the Japanese chromo-xylographer, as we may call him, is able to produce graduations of a degree of fineness, which it would be quite impossible to produce by the mere mechanical application of the roller. The colors are mixed with a paste made of rice, and occasionally a small quantity of plum-vinegar is added, which is said to be necessary to enhance certain colors. The sheets are of small folio size, larger pictures being generally printed upon three sheets pasted together. The Japanese name for these colored pictures is "Nishiki."

Line engravings on copper have also been made since many years, and lately to a great extent in the government printing office.

CLASS 450—454.—DECORATION WITH VITREOUS MATERIALS, INLAID WORK.

Of all the articles which come under this class, the cloisonné enameled ware is probably the most known and appreciated by foreigners. This art industry was introduced from China towards the end of the 16th century, and located itself chiefly in three villages in the province of Owari, not far from the town of Nagoya. It consists in soldering flat brass wires on to the surface of a copper vessel, and in filling up the cells produced by this arrangement with vitrifiable colors, which are then baked, ground and polished.

The process employed may be briefly described as follows: The workman covers the design on paper with a plate of glass, bends the wire according to the shape indicated by the drawing, and by means of a gummy decoction made of the root of a kind of orchis, applies it on edge on to the copper vessel. When the application of these wires is completed, brass solder, mixed with a little borax, is put on with a brush where required, and the piece thus prepared is then baked in a charcoal fire. Afterwards the cells are filled up with the vitrifiable substances, composed, similar to the porcelain colors, of glass powder, white of lead, stone-powder and metallic oxides. The applications of the enamel and the subsequent baking, are repeated three or four times until the coating has acquired a sufficient thickness. The surface is then ground, first with a coarse sand-stone, then with stones of finer grain, and finally with charcoal.

Latterly, cloisonné enameling has also been used for porcelain, which for this purpose is first ground to remove the glaze wherever the vitrifiable substances are to be applied, as without this precaution they would not adhere to the porcelain. The process is similar to that used for metal, with the exception that the wires are fixed on to the porcelain, not by soldering, but by applying a very fusible glass to them. Afterwards they obtain a firmer hold by means of the fused enamels.

These kinds of cloisonné ware are now made not only in Owari, but also in Kiyoto, Osaka and Tokio.

DEPARTMENT VI.

AGRICULTURE.

CLASS 600—606.—ARBORICULTURE AND FOREST PRODUCTS.

Forests are by no means scarce in Japan, and in certain provinces there is even a very great abundance of wood; and as the demand for this material has always been of a very regular nature, and further, as no extraordinary requisitions have been made by a rapidly increasing industry, there has been no particular reason for an imprudent destruction of the forests, and to a certain extent, it may be safely stated that wood is still abundant. But with the opening up of the country, the industry will increase, and it is the intention of the government to decide in time on such measures as will assure the preservation of the riches which the country possesses in its forests.

Their cultivation is carried on with regularity, especially in those parts of the country where charcoal is made. Either nurseries are established and the young trees transplanted from thence to the forest, or else, in places where the space is insufficient for the nurseries, the ground having been cleared of its forest of 15 year old pine trees, is planted with potatoes for a few years and then again sown with pine seeds.

The greater part of the forests is composed of conifers, of which the *Cryptomeria japonica*, *Chamaecyparis obtusa* and *Pinus densiflora* are the ones mostly used. Leaved trees are chiefly to be found in the north. The catalogue published by the museum authorities contains one hundred samples of sections of the principal woods, accompanied by the Japanese and the botanical names.

POMOLOGY.

CLASSES 610—611.

The climate of Japan is such as to produce fruits of similar species to those in Europe, but no tropical plants, such as bananas, mangoes, etc. A great variety of oranges, peaches, nectarines, apricots and plums, different sorts of pears, and one kind of apple are to be found; also grapes and a sort of medlar, but no cherries excepting the wild cherry. A fruit peculiar to Japan, and of great variety, is the Kaki (*Diospyros kaki*) or persimmon. Figs and pomegranates are still grown in the neighborhood of Yeddo.

The Japanese pomologists are well acquainted with the art of grafting, and it is even probable that they make use of some methods which are as yet unknown in other countries. Nevertheless, fruit trees are not so extensively culti-

vated as in America and Europe. Preserved fruits are prepared with sugar, or, as in the case of plums, with the residue from sake-brewing. Grapes are used for food only, and not for wine. Kakis are preserved by drying.

AGRICULTURAL PRODUCTS.

CLASSES 620—621.—CEREALS, VEGETABLES, ETC.

Ancient legends attribute the origin of agriculture, together with other benefits bestowed on the Japanese nation, to Amaterasu-no-mikoto, the divine ancestress of the imperial dynasty. By her command a younger brother descended to earth, and explained to Ukemochi-no-kami the methods by which the soil of the country might be made everlastingly productive of those means of sustenance which are indispensable to man. Ukemochi-no-kami set to work and spent his whole life-time in endeavoring to profit by the instructions he had received for the welfare of his countrymen. He taught them how to raise horses and cattle, and how to cultivate the various cereals, the rice, the wheat, the barley, the "awa" or Italian millet (*Letaria italicica*), the "hiye" (*Panicum verticillatum*, Thunb.), and various kinds of peas and beans. It is further related that these different products were submitted to Amaterasu-no-mikoto for approval, and that she was satisfied with the results, and promised ever to give help and protection to Japanese agriculture.

The above-mentioned plants are those chiefly cultivated; the rice, however, is the most important of them all, and one of the names of Japan deriving its origin from this plant, means "the land of the prosperous ear (the ear of the rice) of fifteen hundred autumns. The whole of the cultivated ground is divided into paddy-fields ("ta") and dry fields ("hatake"), where other cereals are cultivated. The surface of the paddy fields is estimated at 1,587,757 hectares, and that of the "hatake," or dry fields, at 1,421,453 hectares, which would make a total of 3,009,210 hectares. The total area of cultivated land, including tea and other plantations, together with the ground covered by buildings, is estimated at 3,421,442 hectares. The annual yield of the paddy-fields is said to amount to 50,512,000 hectolitres, the total value of which is estimated at 162 millions of dollars, and making an average of 3,181 litres per hectare. This agrees tolerably well with the following statements: In the province of Higo, which is considered as one of the most fertile districts, the best soil in the neighborhood of the village of Yamashiro yields in good years 3729 litres per hectare, and in bad years 1891 litres; the worst kind of soil yields in good years 1891, and in bad years 1582 litres per hectare. In the province of Musashi, which is not remarkable for its fertility, the best soil in good years gives an average of 3092, and in bad years of 1465 litres per hectare.

The total annual yield of the "hatake" is estimated at the following figures:—

	Hectolitres.
Wheat, barley, spelt, etc.,	33,300,000
Beans and peas,	11,700,000
Various kinds of millet,	11,700,000
 Total,	 56,700,000

estimated at the value of 100 millions of dollars, with an average of 3571 litres per hectare. The considerable produce yielded both by the "hatake," and by the paddy fields, must be attributed to the great care bestowed in cultivating and manuring the soil, and to the system of growing the plants in rows, which allows the production of two crops, whilst a short time of fallowness is given to one or the other part of the field after each crop.

Japanese agriculturalists divide the soil into four large categories, dry soil and wet soil, fields upon the hills and fields on low ground. In the north the wet soil and the fields on low ground predominate, whilst in the other parts of Japan the dry ground and fields on hills are more frequent. But then, of course, soil of all kinds is found in the various provinces, and the rotating system undergoes more or less modifications according to its nature and the climate. The young rice plants are set out in the paddy fields in regular rows of bunches towards the end of May, or in the beginning of June, having been previously raised in some different place. The harvest takes place in September or October. The land either remains fallow till the next spring, or else the water is let off, and wheat, barley, spelt, beans and colza are grown and harvested in May, when the rice plants are set out again. In the dry fields of "hatake," cereals such as wheat or barley are sown in rows and on ridges in October. Before they are harvested, certain kinds of beans and peas are sown in the rills in April and May, and grow up between the wheat or barley, which is harvested in June. The beans and peas ripen a few months later, and then a similar rotation begins over again. All sorts of cereals, vegetables, oil plants and others are thus grown in rotation; but it would take too long to enumerate all the combinations which can be adopted by the farmer. The principle feature of the agricultural system is, that the plants are always grown in rows, leaving enough space between them to allow the sowing of new seeds before the preceding plants are harvested. In this manner the fields are mostly cultivated all the year round, the one or the other half of the parallel rows having alternately a short time of rest when they remain uncultivated.

Great care is bestowed on the manuring of the fields, the following substances being used for this purpose. Manures of a mineral nature consist of marls, shells and ashes; those of vegetable origin of inferior kinds of beans and peas or their residues, of oil-cakes, the residues of sake-brewing, the stems of the

indigo-plant, decomposed vegetable materials and weeds; those of the animal kind are composed of human faeces, stable dung, bones, also of dried fish, such as sardines and herrings, the residue of fish oil, etc. The farmers consider the fish manure and the oil-cakes as being the best, but these are rather expensive. Stable dung is not very abundant, as the cattle is mostly used out of doors, and further because the number of horses and cattle is rather limited. In 1872, their total number was estimated at 2,018,500 head.

The favorite article of food of the Japanese people is the rice, of which there are two principal kinds, the one growing on the hills, and the other on moist land; of the latter there are several varieties. The excellent kinds of beans and peas, which are made into a kind of cheese and a peculiar mixed dish called "misso," afford the necessary nitrogenous substances, and to a certain extent form the substitute for meat; the Soyu also belongs to this kind of food, and is frequently mixed with other dishes. With regard to animal food, it is limited almost exclusively to fish, poultry and eggs. But a change has already been effected to a certain extent in the larger towns, where butcheries have been established. An experiment of sheep farming was commenced one or two years ago.

CLASS 623.—TOBACCO, TEA, ETC.

Tea may be regarded as one of the staple products of Japan, the export of which is chiefly directed to the United States. It was first cultivated in the beginning of the 13th century, when the priest Miyoye brought over seeds from China, first into the province of Chikuzen in Kiushiu, and afterwards into Togano-o and Uji, south of Kiyoto. The latter province is considered as producing the best kind of tea. The cultivation of the plant, and the preparation of the tea, which differs from the Chinese process, are treated in a special pamphlet, published by order of the Board for promotion of industry, agriculture and commerce, to which reference should be made. The tea plant growing in the province of Suruga, is said to be a native of that part of the country, where its qualities, on being discovered some six centuries ago, led to its cultivation.

It is an interesting fact that owing to the particular condition of the climate on the west coast, the tea-plant in Japan grows much farther north than is generally admitted, viz., to the 39th degree, in the province of Yechigo, and the neighborhood of Niigata. According to the observations of one of the residents of that city, who attributes the mildness of the climate to the peculiar currents existing in the Japanese sea, the average temperature of the coldest months, January and February, is but little above the freezing point. The thermometer goes down, however sometimes as low as 16° Fahrenheit, and the preservation of the plant, in spite of this cold temperature, must be attributed to the fact that the winter sets in with heavy falls of snow, and that the layer of snow protects the plant against the effects of the cold. This occurs when the plant is flourishing, and when fructification has already begun. In spring the snow rapidly melts,

the buds of the preceding year open up, and the seeds ripen until the following autumn, when they fall off and are carefully gathered up. Tea seeds are frequently used in Japan for making a very fine oil.

Ever since the earliest periods of its cultivation, the tea has been very highly esteemed in Japan, on account of its beneficial effects on the mind and body of man, and became soon one of the necessities of life, as well as the indispensable accessory of any friendly gathering. It is immediately offered to welcome the visitor in any Japanese house, and from morning to night everything is kept ready for its preparation. As it possesses no intoxicating properties, it constitutes the most suitable beverage for a quiet party, whose members desire to unite in peaceful and intimate conversation. Such being the case, the tea may even be said to have had a certain influence in history, from the ceremony known by the name of "Cha-no-yu." The Shiogun Yoshi-masa, of the Ashikaga family, who was in power from 1448 to 1473, A.D., having succeeded in establishing peace, instituted the custom of assembling small parties of friends, and framed certain rules concerning the etiquette to be observed on such occasions, in order to avoid all excitement, and to bring people into as intimate relations with one another as possible. At a later period this custom was especially favored by the Shiogun Hide-yoshi (or Taicosama, 1586-1598), whose intimate friend and follower, Ri-kiu, amended the rules framed by Yoshimasa, and established the ceremonial, which is still observed at these parties. At first they were held on the veranda, facing some retired corner of the garden, and the space where the guests sat, was enclosed by screens. The number of the guests to be present on such occasions was fixed at the heavenly number of five; and consequently the space required was limited to three mats, each 6 feet by 3. Afterwards particular rooms of similar size, or separate spaces in larger rooms, were set apart for the purpose. A small garden, arranged so as to resemble as much as possible a natural landscape, giving an idea of retirement and quiet, constitutes the scenery indispensable for the ceremony. When the guests assemble, the house is kept entirely quiet, the servants are all sent away, and the master of the house himself waits upon the guests and prepares the tea. The room is without any kind of ornament, with the exception of a scroll of silk, on which some sentence is written in large characters, and which hangs down from the wall. The guests leave their swords outside; and after they have been welcomed by the master of the house, he brings in all the utensils required, the charcoal bag, the fire pot, tea kettle, etc. Whilst he is preparing the tea with water, which has already been boiled the day previous, the guests are allowed to inspect the various implements, viz., the box filled with scents, which are thrown on the fire, or the tea bowls, etc., which are often things presented to the owner, as a reward for some meritorious action. The tea used is powdered tea-leaves, and is either prepared in a thick or a thin beverage. The bowl, out of which all the guests drink, is merely of common pottery; old earthen-ware of unknown origin, imported from

Manilla or Siam, etc., was highly valued, and similar utensils, named "raku," were manufactured for the same purpose; this kind of vessel is still used, and foreigners are often surprised to find in shops such rough looking articles, surrounded by rich silk brocades and beautiful boxes. When the thick beverage has been served to the guests, the bowl is handed around, and care is taken that it should not come around empty to the last guest. The symbolical meaning of this ceremony is that during the party a perfect equality, without distinction of rank, prevails amongst the guests, and that they are united in perfect harmony and friendship. Afterwards the thin beverage is served out; here each guest empties the bowl and hands it back to the master, who refills it for the next person. The conversation, according to the rules, may only have reference to the ceremony itself; any departure from truth, even flatteries, must be avoided, and the guests must enter the house with a pure heart and a sincere mind. It is to be supposed that Taicosama, when he attached so great an importance to these tea parties, had in view the object of awakening more peaceful sentiments in the minds of the gentle class of people, who had for a long time been accustomed only to struggles; and also to bring together persons of different factions, under circumstances which would remove all causes of new discord. It may also be noticed, that he very shrewdly made use of the peculiar utensils used at these ceremonial tea parties, for rewarding meritorious actions, instead of giving more substantial presents, in the shape of land or treasures. The importance of the ceremony of the *Cha-no-yu*, as it has been described, has been somewhat diminished; however, it still occasionally takes place, and special teachers instruct those interested in the ceremonies and manipulations, which are strictly prescribed, even down to the smallest details.

The *tobacco* plant, called "tabako" in Japan, was introduced by the Portuguese in 1627, and first cultivated in the neighborhood of Nagasaki; whence it spread farther north and south, and is now cultivated even in the most northerly parts of Nippon. The best kinds are from Satsuma, Higo, Osumi, and the districts to the south and north west of Tokio. It is extensively used in the country, where it is sold by the retailers cut very fine by means of a small machine, and is smoked by men and women in diminutive metal pipes. The annually increasing export is chiefly directed towards England, where it is much sought after on account of its properties of absorbing a large proportion of liquid.

ANIMAL AND VEGETABLE PRODUCTS.

CLASS 650.—*SEA-WEED, ETC.*

Several kinds of sea-weed are used as food, and form important articles of the trade with China. Generally they are natural products, which have only to be collected; but in certain cases their growth is increased by some ingenious

contrivance devised for the purpose of producing their development under the most favorable circumstances. In the neighborhood of Tokio, where the water is shallow, long rows of branches of the “*Quercus serrata, Th.*” are placed in the bottom of the sea during spring. In June or July, small buds of a reddish color appear upon the branches; two or three months later they have grown into soft round leaves, apparently similar to stems, and several inches in length; these stems now rapidly flatten out at the ends into broad leaves, which are taken off every alternate day all through the winter, until the end of March. At this period they become hard, unfit for use, and fall off during the summer months. The quality of this sea-weed depends very much on the weather, and is best when frequent rains and falls of snow have rendered the shallow water more or less brackish. Too large a proportion of sweet water is unfavorable to the growth of the plant. About 259 years ago it was gathered in large quantities at the mouth of the Sumidagawa, near Asakusa, in Tokio; but as the river carried down with it a large quantity of gravel, its mouth advanced more and more into the sea, and the water near Asakusa becoming too sweet the plant disappeared. Owing to this circumstance the above described mode of cultivation was instituted; the weed, however, has preserved its former name of “*Asakusa-nori.*” The branches of “*Quercus serrata,*” on which the weed grows, are said to answer their purpose during three years; after that time, however, the bark comes off, and the weed does not grow any more.

Another very interesting product is the “*Kanten,*” or vegetable isinglass, prepared from the “*Gelidium corneum.*” The sea-weed, called “*Tengusa*” in Japan, is carefully washed and afterwards boiled, so as to form a gluish decoction, which is strained off and put into square boxes. When cooled, it forms a stiff jelly, which can easily be divided into squares of a foot in length. The manner in which the surplus water is removed, is most ingenious, and worthy of notice. The jelly prisms are exposed in the open air during a cold night, and allowed to freeze. During the day the sun melts the water, which runs off, leaving behind what one might term the skeleton of a white horny substance, which is extremely light, and easily diluted in hot water; when cooled it again forms a stiff jelly. This article, which is already to a certain extent known in Europe, can be applied to many uses, viz., for cooking purposes, for making bonbons and jellies, for clarifying liquids, as a substitute for animal isinglass, for making moulds used by the plaster-of-Paris workers, for hardening the same material, in short, as a substitute for all kinds of gelatines, over which it has the advantage of producing a firmer jelly. In Europe it is sold under the name of “*Agar-agar.*”

Another sea-weed, much used for industrial purposes, is the *Fu*, resembling the Carragheen moss, and applied to similar uses, such as, for instance, the sizing of the warp of silk goods.

CLASS 657, 658.—FLOUR, STARCH, ETC.

Wheat flour is prepared in water mills, and generally ground between granite mill stones, but is not used for making bread. It is mixed with all kinds of dishes, made into cakes, transformed into various articles of food, and prepared on the same principle as macaroni, vermicelli and pates d'Italie.

Of the various kinds of starch, some are peculiar to Japan and worthy of notice; these are the "Kudzu" or starch made of the root of "Pueraria Thunbergiana," the "Kata-kuri," made of the root of a kind of dog's tooth violet, and, finally, the starch which is prepared from the root of the fern (*Pteris aquilina*). All these three plants grow wild, and the "Kudzu," which yields the best starch, is very abundant in certain places. It belongs to the family of the "Papilionaceæ," grows very rapidly, and in a short time its creepers cover the ground, spreading over the neighboring bushes and trees, and enveloping the rocks and stones with their luxuriant foliage. The root is frequently over 5 feet in length, and as thick as a man's arm. But for the manufacture of starch by the ordinary process of crushing the root, washing the starch out and decanting it, moderate sized roots one foot in length and an inch in diameter are mostly used. The starch is of a fine color, and has a most agreeable flavor; mixed with warm water it produces a firm transparent paste.

The method of preparing the two other kinds of starch from the roots of the dog's tooth violet and the fern, the former of which merits a special mention of its qualities, does not present any peculiarity. Both form articles of food, but the fern starch is also used in various industries, as it produces a very strong paste, called shibu, on being carefully mixed with the sap of unripe persimmons. The fibres of the fern root, after the starch has been washed out, are made into ropes, which are used in the mud-walls of the buildings, so as to afford a better hold for the loam.

It should be mentioned that the manufacture of starch-sugar has been long known in Japan. Millet and rice are used for the purpose, and, after having been steamed, they are mixed with a certain quantity of malt or ferment, and kept for several hours, at a fixed temperature, in close vessels, after which the liquid portion is strained and concentrated by evaporation to a strong syrup or a solid mass, which is formed into bars while still hot. Vendors of this starch-sugar are often to be met with in the streets, where, to the great enjoyment of children, they manufacture all sorts of animals and figures with this material by a process quite similar to that of glass blowing.

It has been mentioned above that the various kinds of beans constitute a very important element of the national diet. Some of the preparations made of beans and peas are worthy of a short notice.

In preparing the "Tofu," white beans are soaked in water, ground between two stones, strained through a sieve and afterwards boiled. The contents of the

kettle are then filtered through cotton cloth and the residue pressed out. The liquid, which may be considered as an alkaline solution of legumine, is precipitated by successive additions of the bitter lye which runs off from sea-salt by deliquation, and which is mostly composed of magnesium salts. The precipitate is legumine with a small percentage of legumine-composites and a large proportion of water. The "yuba" is also made by boiling the above-mentioned legumine solution in an open kettle, with a slight addition of ash-lye. The insoluble skins which form upon the surface of the boiling liquid, are taken off and dried.

Another kind of preserved food is the "misso." White beans are first boiled, pounded in a mortar to form a paste, then mixed with fermenting rice and salt, whereupon the whole mixture is placed in tubs and left in some cool place; at the end of a month it is ready for use.

In mentioning the various preparations made of beans, the "Soy" or, as the Japanese call it, "Soyu" should not be omitted; but as it belongs rather to the produce of fermentation, the process will be described under the head of Class 660.

CLASS 660.—ALCOHOL AND MALT LIQUORS.

"Sake" or, as it is sometimes called, the rice wine, forms the principal and almost the only alcoholic beverage of the country. It is made exclusively of rice. In preparing the ferment the rice is washed, steamed during several hours, and spread out on mats to lower the temperature; afterwards it is kept in a warm room for several days, where it is mixed with a certain quantity of rice covered with fungi; these latter grow rapidly over the whole surface of the rice. The fermenting wort is made of fresh rice, also steamed, and mixed with water and a certain percentage of ferment in small tubs. A large coop is filled with these mixtures, and kept for about eight days at a certain temperature, which is maintained by introducing a vessel filled with hot water into it. The wort first gets a sour taste, whereupon the temperature is lowered; at a later period the taste becomes bitter, and then the wort is quickly cooled, so as to stop further fermentation. In January the real brewing begins. Again fresh rice is steamed, washed with a considerable percentage of both the ferment and the wort, mixed with a sufficient quantity of water. The whole is then transferred into big vats, frequently stirred, and left for about 20 days, at the expiration of which period it usually acquires a vinous taste. The mash is now placed in bags and pressed; and the liquid runs out into casks, where it settles, whence it is tapped when quite clear. The clear liquid is then heated up to a certain point, and kept in large butts. This sake is generally drunk hot at meals. The residues and the spoiled sake are distilled and the alcoholic liquid used for making the "mi-rin," or sweet liquor. The total production of "sake" in 1874 is estimated at 6,501,083 hectolitres; that of certain inferior kinds of sake at 127,446 hectolitres; that of brandy at 60,557 hectolitres; and, finally, that of sweet alcohol liquors at 56,712 hectolitres.

The soy, or "soyu," is made of a small bean, the "Dolichos soja," or "Soya hispida," to which are mixed wheat, salt and water. The beans are first boiled, and the wheat bruised and steamed; both are then mixed with a small addition of fermenting wheat, placed in flat wooden boxes and kept for several days at a fixed temperature in a special room. At the end of three days, the mass is all covered with fungi and partly with roots of germination. After having been mixed with a salt-lye, which has been prepared hot and allowed afterwards to cool down, and to depose certain impurities, the mashings are now removed to enormous coops in which they are kept for several years. Experience has shown that the best soy is produced by mixing equal quantities of mashings of three years and five years' standing. This mixture is transferred into bags of thick cotton-cloth, placed in large boxes, and then submitted to pressure—at first only to a slight pressure, which yields the best soy, and afterwards, however, to a gradually increasing pressure, the separation of the last portions being assisted by an addition of salt water.

The soy forms a very important condiment for all kinds of dishes, and is consumed in large quantities. In 1874 the production amounted to 1,506,402 hectolitres.

TEX TILE SUBSTANCE.

CLASS 665.—COTTON.

The original cotton-plant (*Gossypium herbaceum*), now cultivated, is said to have been introduced from China, during the latter part of the 16th century. There are now several varieties, occasioned by difference of soil, climate, and methods of cultivation. The soil of the province of Totomi, to the southwest of Tokio, one-third of which is composed of sand, is looked upon as being the most favorable for the growth of cotton. In the month of May, parallel rills are excavated between the ridges of the fields in which wheat is grown, and are filled up with a manure, prepared some time previously, of ashes, oil-cakes, dried weeds, rice husk, bran, and mud. Within the short space of ten days after this very important manuring, the seeds, which have been soaked in water, and mixed with ashes, are sown, covered with earth and slightly stamped down. By the time that the plants have attained the height of a few inches the wheat is cut, and the cotton alone remains. The latter is frequently manured, and in July the top of the stem is broken off, in order to force the plant to branch out and produce a greater number of flowers. When the branches begin to shoot buds, their ends are likewise broken off; and any new branches without buds are removed. In October the capsules open, and the cotton is collected every day and dried in the sun. The ginning and cleaning operations have been already described under Class 230.

CLASS 666.—HEMP, JUTE, RAMIE, ETC.

Before the introduction of cotton, the hemp "Asa," together with the silk, formed the principal materials for textile fabrics. The most important seat of this industry is the old capital of Japan, Nara, in the province of Yamato. With regard to the preparation of the raw material—it is first steamed, then soaked in water for one day, and afterwards stripped off from the stem, which remains unbroken. This process yields the whitest hemp. A more inferior kind, of a yellowish tint, is produced by soaking the stems in water for several days, without steaming, and then stripping the bast off. A third quality is stripped off immediately from the stem, and consequently preserves a greenish color. The stems are used for garden fences, and similar purposes, and sometimes also for making charcoal, used in the manufacture of gunpowder.

The hemp is cultivated in rows, according to the general system of agriculture, and manured several times. Concerning the preparation of the fibre, reference should be made to Class 233.

Flax is not cultivated now-a-days, although it is said that it grows wild around Oji, not far from Tokio. Formerly, it was cultivated in some few places, and called by the name of "ama," or "nume-goma," but only for the sake of the seeds, which were used for medicinal purposes. In later years foreign seeds have been introduced as an experiment.

Two other fibrous plants, well known in Europe, are the "ichibi," or jute (chorchorus), and several varieties of china-grass (*Boehmeria*); both are chiefly cultivated in Yechigo. Some kinds of nettle (*urtica*) are also used for textile fabrics.

CLASS 668.—SILK IN THE COCOON, AND REELED.

In the notes on Class 242, a short mention was made of the history of the silk industry in Japan. It appears to be a well established fact, that silkworm breeding and the cultivation of the mulberry-tree was first seriously started with the assistance of some Coreans in the third century, A.D. Since that time, this branch of industry, to a certain extent connected with agriculture, has spread over a great part of Japan, or rather, over the island of Nippon, since hardly any silk is produced, either in the island of Shikoku or in Kiushiu. The silk producing districts are situated between the 35th and 39th parallel; a small quantity, however, is also produced in the more northerly provinces, even as far north as Kuroishi, which lies in the latitude of $40^{\circ} 30'$. But the districts most important, both on account of the quality as well as the quantity of the silk, are situated between the 36th and 39th degree. Large silkworm breeding establishments are very scarce; and the silk production may be considered as a domestic industry of the farming classes. For all the details concerning the cultivation of the mulberry tree, and the manipulations in feeding and taking care of the silkworms, reference should be made to the special pamphlet published by the department for experimental sericulture in Tokio, and accompanied by diagrams and models, which are on exhibition in the Agricultural Hall.

DEPARTMENT VII.

HORTICULTURE.

A house without a garden is a thing that hardly exists in Japan; and even in the larger cities, however small the amount of available space may be, it is certain to be turned into a complete garden, with roads, water-basins, rocks, bridges, etc. The peculiar style of gardening was originally introduced from Corea, and is apparently connected with the principles of ancient Chinese philosophy concerning the harmony of nature. There are certain rules by which gardeners are guided, and which have evidently been established by persons who were close observers not only of nature, but also of the sentiments and impressions produced by nature on man. A Japanese gardener designates his work by the term "San-sui" (*i. e.*, mountains and water), a word having especial reference to the peculiar arrangement of the gardens, which are laid out with a view of reproducing even on the smallest scale a complete landscape, with all the accessories needed to produce variety or rural retirement. It must not, however, be supposed that this system consists exclusively in the construction of those miniature gardens which have been so often described and pictured in foreign books on Japan and China. Wherever the amount of space is large enough, the gardens are laid out on an extensive scale. The imperial gardens, and the grounds which surround the dwellings of the rich, contain beautiful parks, with large trees of all kinds intersected by rivulets and ponds, which look like small lakes, since the gardeners possess the art of planting trees and erecting artificial rocks, etc., in such a manner that the looker on is unable clearly to distinguish the banks, and is completely deceived as to the real dimensions. Anyone who has visited one of these larger gardens will have noticed the manner in which the view changes at each turning, and the skill with which an impression is produced on the visitor that he is wandering through much larger grounds than is really the case.

No matter how small may be the garden, this principle of producing the impression of a real landscape is always observed; but of course everything, the hills, the rocks, the lakes, bridges, etc., have to be reduced to smaller dimensions, and it is quite natural that the Japanese gardeners should also have reduced old trees of all kinds to miniature dimensions. These strange products of horticulture called "dwarf trees," often 150 or 200 years old, with big trunks only a few feet high, and with exactly the same shape as any forest tree, would of course appear ridiculous in a large garden side by side with old full grown trees. But if they be put in their right place, with surroundings that are in harmony with the principles which led to the production of these extraordinary works of horticulture.

tural skill, the impression made will be entirely different. That certain principles of quite an ethic nature form the ground work of the art of gardening, is a peculiar fact which can be seen even in the smallest details. Thus, for instance, the ordinary garden is always located opposite the drawing-room of the house, and arranged in a gay and bright manner so as to make it an agreeable place for receiving visitors or passing away the time with the members of one's family. But if there should be in the house a particular room reserved for those quiet tea-parties, called "cha-no-yu," where the most perfect calm of the mind is required, a separate garden, of a wholly different character, is laid out in front of this room. Here it was that the large stone lanterns, which in earlier times only formed temple ornaments, were first used to beautify the garden, and which half hidden by the trees, throwing their dim light through the dark foliage, necessarily contributed in endowing the whole scenery with a character peculiarly in harmony with the object of the assembled party.

These landscape gardens, as we may call them, are even constructed within the narrow limits of bronze or porcelain basins, and the jardinières which are placed in the rooms often contain a whole rocky landscape, with mosses, various grasses, small bamboos and dwarf trees.

This peculiar taste for impressions such as are produced by nature when seen in a landscape, may suffice to explain the reasons why the cultivation of evergreen trees and shrubs, which are very abundant, and the production of certain plants remarkable for their peculiar foliage, are greatly preferred to the cultivation of flowers, whose beauty soon fades, whereas the foliage may be enjoyed throughout the whole year. The flowers of the country mostly cultivated by the gardeners are comparatively few in number, and are especially effective in masses, when trees are covered and gardens filled with them. They consist of the various kinds of cherry, plum and peach trees, with beautiful colors in all shades, from snow-white to purple-red, and further of the chrysanthemum, the iris, the lilies, the camelias, the azaleas and some others; the rose, only lately introduced from abroad, has also become a great favorite. There yet remain a certain number of other fine flowers, which have not been named here; the above mentioned, however, are favorites of the whole nation, and form an important accessory in all the holidays and amusements of the people.

Very often the gardeners make an exhibition of great quantities of a certain kind of these flowers, and arrange them in all sorts of fanciful ways, constructing large human figures, animals and miniature mountains, in imitation of the Fusi-yama, etc, all composed of chrysanthemum or other flowers. There is scarcely a Japanese house, even of the poorest, in which branches of the plum tree, of some kind of iris or of other plants would not be found, decorating the room in their proper season. Rich people often pay very high prices for rare specimens of horticulture, and always take good care to have their garden in

proper order. History says that during the reign of the Emperor Montoku (851-859 A. D.), the prime minister himself laid out the gardens of the imperial palace. The first notions concerning gardening were introduced into Japan by a Corean, during the reign of the Empress Suiko (593-629 A. D.). A visit to the Japanese garden on the exhibition grounds will furnish the necessary illustrations to the above explanations, and will afford people an opportunity of judging as to how far the Japanese gardeners, in developing this art, have kept themselves free from those exaggerations which are so frequently imputed to Eastern horticulture.

ADDITIONAL NOTES.

LACQUER WARE.—[See Page 72.]

The solidity and durability of the lacquer ware of course depends not only on the outer coatings, but chiefly on the careful priming of the ware. When the operation of lacquering has been done in the way described on Page 70, the durability of the lacquer is quite extraordinary, as will be understood in examining the objects on exhibition, several of which are 300 years old and more. A test of a most severe nature has been made lately—against their own will—by the Japanese Commission of the Vienna Exhibition. Part of the collections bought for the Yedo Museum, together with some Japanese goods, had been loaded on board of the French steamer "Nile," which foundered off the coast of Japan at a depth of about 25 fathoms, in the beginning of 1874. Since that time Japanese divers, without any other apparatus but some ropes and hooks, have succeeded in raising over 200 chests out of the ship, and amongst these some containing lacquer ware of good quality. Although these objects had been under water for more than eighteen months, the wood-work, also the gold paintings and the lacquer coatings, were entirely intact, and had even preserved their gloss almost unchanged, whereas the locks and other ornaments made of pure silver, had taken a sort of gray purple tint by the action of the sea-water, which of course had soon penetrated into and filled up the tin-lined chests. Another test, also stronger than any which foreign lacquer has to undergo, is made every day in Japan, since lacquered bowls are used for hot soups and dishes of all kinds and alcoholic liquids are served out hot in lacquered cups. Even the Shunkei urushi (see Page 73), although applied in thin layers only, resists the action of heated alcohol.

Cheaper articles, of the kind which the manufacturers have to make for foreign markets in order to meet the low prices offered to them by the ex-

porters from Japan, do not stand the tests which have been explained. In this ware the priming is done with glue or paste, instead of pure lacquer; and there it may happen that a continuous action of the water, or the influence of a dry heat, etc., causes the lacquer coating to raise and to separate from the wood it is laid on. But such a thing is not to be apprehended with genuine lacquer ware.

NOTE TO CLASS 254.—(Page 83.)

The fancy articles exhibited in the women's pavilion, have been manufactured at the "Jokojo," or association for women's work of the city of Kiyoto.

This association was established five years ago, for the purpose of giving to young girls, especially to singers and dancers, whose education is mostly very incomplete, instruction in sewing, weaving and other industries suitable for women. An establishment was founded in some quarter of the city, receiving girls from within the division where it belongs to, and teaching them gratuitously, sewing, embroidering, weaving and other needleworks. There is now an establishment in almost every quarter of the city, and their total number amounts to thirteen.

Trustees elected by the public, one for each establishment, have the supervision of these schools. Their revenues apportioned to meet the expenditure, vary according to locality; they are mostly derived from the taxes to be paid by singers and dancers, etc., or from voluntary contribution or from loans. The sale of the articles made by the pupils, also meets a certain portion of the expenditure. *

DESCRIPTION OF THE

Silkworm Breeding in Japan.

PUBLISHED BY THE

“KUWANGIYO-RIYO NO YOSANKAKARI,”

the Government Office for Experimental Silkworm
Breeding at Tokio,and Illustrated by a Series of Drawings, Models and Samples on Exhibition
in the Agricultural Hall of the Centennial Grounds.

The “Yosankakari” was opened in 1874, for the purpose of investigating the present state of silkworm breeding, and the nature of the different diseases that exist among the worms in Japan, and of introducing eventually new methods in breeding; also for the purpose of making the results of the researches of European breeders and scientific men known throughout Japan, in order that such knowledge, in conjunction with the old established skill and the long experience of the Japanese breeders, may improve the silkworm rearing, as well as the manufacture of the silk, so as to bring it to its former excellence. The object of the exhibit is to show the way of breeding, and of the operations connected therewith, as they have been carried on for hundreds of years; also to show samples of the silk produced in this country. As so little is known about silkworm breeding in Japan, we believe that this exhibition will be welcome to all who are interested in the matter.

YOZANSHITS.

This is the name of the rearing place. The arrangement of the same is different according to the different ways of rearing. Thus we find in Kodsuke and Musashi a method called Seiriogai (cold breeding), and as here a great supply of fresh air is essential, the worms are reared in the second and very wide story of the building, wherein a great many frameworks, with eleven sides each, are erected. In the province of Shinano, stands with twenty-seven slides are put up, and stepping stands are used to reach to the higher ones. In the province of Iwashiro, Iwaki, Rikuzen, Rikuchiu, Rikugo, Uzen and Ugo, frameworks with twenty-five slides are used, and at the height of the thirteenth is a stage for the

workmen. The cold air is kept out carefully, the paper windows and doors are shut on all sides, and the rooms are rather dark in consequence. The required temperature is obtained by means of a brasier.

KUZU-MAI.

This is the name for such cocoons as, being too thin, out of shape, or unclean, etc., cannot be used well for reeling, and therefore are used for making mawatta.

DEGARAMAI.

The cocoons pierced by the moths are called Degaramai, and they are generally used for making mawatta. But there are also silk threads called Tedori made of these cocoons; this silk has many knots.

MAWATTA.

This is the wadding made of the cocoons pierced by the moths or Udji, or other cocoons that cannot well be reeled. That of the Tamamai (doubles) is the best kind, especially that made in Kokunimura, a village in the province of Iwashiro. The mawatta is manufactured in the following way: The dung of silkworms is burnt and mixed with water, wherein then the cocoons are thrown and boiled. When sufficiently boiled they are dipped into pure water, and then they are unraveled and spread out by two women by hand, and hung up in sheets on a frame called wattadai.

KUZU-ITO.

This is the silk-thread the women twist round their fingers when searching for the end of the regular thread, and after the Noshi-ito has been taken off. Often disorderly and twisted threads of any kind, the waste silk in general, are called so.

NOSHI-ITO.

This is a silk obtained from the first much disordered threads that are pulled off the cocoons, after they have been in hot water for a short time, with the fingers before the regular reeling can begin. It is called also, sometimes, *Kuchi-ito* or *Hashi-ito*.

KI-ITO.

Raw silk of any kind is called Ki-ito. It differs greatly in quality, as this depends on the kind of worms, the water used and the skill of the workwoman, further even on the way of cultivating the mulberry trees and on the rearing of the worms, and no good silk is produced if one of these points is neglected.

There were originally three kinds of silk produced, the cocoons being spun by different kinds of caterpillars; the worm called Oshiro made a big-cocoon, the Imamucashi a middle sized one, and the Matamucashi a small one, but the

cocoons of all the three were white. The rearing of these worms is difficult, as they are very tender, but the silk is of the first class, while the worms making green cocoons are very strong, but give only inferior silk.

YAMAMAI-NO-MUSHI

This is the name of a caterpillar that feeds on the leaves of different oak trees, such as: Kashi-no-ki, Nara and Kunogi. The yama-mai is reared either naturally or artificially. The reeling of the thread is similar to that of the thread of the common silkworm, but only one cocoon is reeled at one time.

SHIRAGA-MUSHI.

This is a kind of silkworm that feeds on the leaves of the chestnut tree, but if reared artificially, it remains lean and the thread is thin. In the common way of reeling, only a very inferior thread is obtained. Therefore the following way has been adopted: after the worm has reached its full size, it is laid in vinegar that has been boiled once; then a slight cut is made just behind the scales of the head, but without injuring the gut; then taking the latter with the fingers of the one hand, and the body of the worm with the fingers of the other hand, the gut is drawn a little out of the body. Then the worm is laid in vinegar again, and after a while the gut is pulled out a little further and so on.

Through the influence of the vinegar the gut changes its color into white, and can gradually be pulled out to a length of from 5 to 6 feet without breaking. This thread is very strong and also transparent, and therefore chiefly used for fishing purposes.

MIZUGI-KAIKO.

Three years ago a man named Oshima of the Kagoshima-Ken noticed the cocoons of these caterpillars first on a tree called Mitzgi, and began to study the nature of the insect, and how it could be reared and the thread be gained. His observations are as follows: the chrysalis winters in the cocoon, the moths appear in spring, and then the pairing takes place; within three or four days one female lays over 200 eggs. In the commencement of summer the young worms break the shell; they cast the skin four times, and then spin their cocoons inside a leaf bent round.

About 30 days later, at the end of summer, again moths come forth, lay eggs, and after a little more than 10 days, the worms creep out. They also cast the skin four times, and spin their cocoons as before, but the moths appear next in the following spring. The cocoons are of a light brown color, the thread is shining, and the reeling of it the same as that of the common silk thread, but its quality is very inferior.

KUWA-ZONO.

The mulberry trees are cultivated, to suit the conditions of the ground in four different forms and sizes, and are called accordingly: 1. Negari (the trunk

being cut off near the root). 2. Daigari (the trunk is a little higher). 3. Takadaigari (a tree of middle size). 4. Zumiha (a high tree). One or the other of these kinds is chosen, according to the ground being dry or wet, cold or warm; furthermore, according to the trees standing upon a hill, or down near the river, or in sandy places that are often overflowed. In the latter case, Negari is cultivated, but in good firm ground, Takadaigari is grown; and where much snow falls, and strong winds are seldom, Zumiha is preferred.

The directions for the culture of these trees are as follows: In winter time or spring, a hole is made of about $1\frac{1}{4}$ feet in diameter, and $1\frac{1}{2}$ feet deep, the young tree is placed either just in the centre or on one side, and the fibres of the root are spread out to all sides: then they are covered with garden mould half way up, after which the hole is filled out with manure, and upon this 3 or 4 inches of soil are laid. So it is left for many months, only once in summer time and once in winter, the trees are dunged again. Then in the coldest season, the whole field is filled up with soil, and made level. To guard against injuries caused by hoar frost and snow, the branches are bound up with straw ropes, which are taken off again in the following spring. The field is to be carefully weeded, and the weeds to be laid round the trees to serve as manure.

ZUMI-HA-ZARU.

This is a kind of hamper made of bamboo, and used for carrying the leaves from the field to the place of rearing.

HA-OKI-BAKO.

This box is chiefly used about the provinces of Kodsuke and Musashi, and the neighborhood, for the purpose of keeping the young and soft leaves of the mulberry tree (which are given to the young worms) fresh for three or four days, in case rainy weather prevails. These leaves dry very soon exposed to the air, and fermentation soon sets in when they are heaped together. These boxes are placed on the bare ground inside the house, the bottom of each being formed by a piece of lattice work made of bamboo; upon this the leaves are loosely laid; generally, three are put one upon the other, and the uppermost is covered with a wooden lid.

KUWA-KIRI-GAMA.

This is a sickle for cutting off the branches of the mulberry tree. The instrument is handled differently, according to the position of the branches; those that are high up are cut by pulling the instrument downwards, but those nearer the ground by an upward motion, as shown in the drawing.

HATORI-BOCHO.

This is a knife for cutting the leaves off the branches, as they are brought from the field to the breeding room.

HATORI-BOCHO AND MANAITA.**FIRST POSITION.**

The hatori-bocho is a knife for cutting the leaves of the mulberry tree. There are two kinds, a large one and a small one. When the worms are young, the leaves are chopped into very small pieces, and for this a smaller knife is used. But as the worms grow larger, more leaves are wanted, and they are chopped coarser; in doing this, the leaves are piled up about one foot high, and the workman, placing the left foot upon the heap, cuts the heap with a larger knife, moving the same downwards, commencing at the left hand corner, and gradually progressing toward the side where the right foot is placed; a skilled workman can chop a large pile in a very short time.

Manaita is the board on which this operation is performed; it is made from "honoki," a very hard wood without knots or veins, such as does not easily blunt the edge of the knife, which would be very disadvantageous, as a blunt knife—in cutting the leaves—presses the sap out of them.

HAKIRI-BOCHO.**SECOND POSITION.—KUWA-MI.**

This is a flat basket used for separating the parts of the leaves of different weights and the stems. There is a small and a large kind of Kuwami, of which the former is used during the first two stages of the worm's development, the latter after this period. The chopped leaves are gathered in the Kuwami, and, while holding it with both hands, it is shaken to the right and left, and upwards and downwards. By this manipulation the useful parts of the leaves are separated from the heavy parts and the stems.

This is considered necessary, as the ribs and stems of the mulberry leaves contain much sap, do not dry easily, and are therefore apt to cause diseases among the worms.

KUWA-FURUI.

This is a sieve made of bamboo for sifting the leaves. According to the width of the meshes three kinds are distinguished, and the leaves being chopped are sifted and selected to suit the different stages of the worms in breeding.

KUWA-ZARU.

At feeding time the woman takes this Kuwa-zaru, a small bamboo basket filled with chopped leaves, in her left hand, and strews with the right the food over the worms; during this time Kaikokago rests on a stand called "Kagodai."

KUWA-AGE-ZARU.

This is a basket wherein the leaves are drawn up to the upper story of the house, generally by means of a rope and single pulley.

KAIKOMUSHIRO.

This is a kind of mat used in silkworm rearing, principally in the provinces of Kodsuke, Musashi and Shinano. There are two kinds in use differently manufactured; either strings of hemp are interwoven with rice-straw or thin straw ropes are taken instead of the hempen strings. In both cases care must be taken that they are made with wide meshes, to allow a good ventilation.

KUMADE.

This is a kind of rake used for raking and cleaning the straw, wherfrom the Oriwara is made.

ORIWARA.**THE MAKING OF THE SAME.**

After the straw has been cleaned with the Kumade, it is bound together in bundles of suitable size. These are then folded on a small stand to the right and left either by the hand alone or with the help of a small board, thus forming small packs. A string is tied round each pack, and thus, after having been trimmed with a pair of scissors, they are kept for a time sufficiently long that, if the string is cut, the straw takes the form of the Oriwara.

KAIKOBASHI.

These are chop-sticks generally made of bamboo. When the worms are carried over from one mat to another by means of the net called Kaikoami, some worms always remain on the mat, and these are taken away by the Kaikobashi, as the perspiration on the fingers is considered injurious to the insect. But if the worms are taken up by the hand, the woman must wipe her hands first with the leaves of mugwort, a bundle of which is hung up for this purpose near the place; the sap of the leaves takes off the perspiration.

KAIKOAMI.

This is a net for carrying the worms from one mat to another, when the excrements and the spoiled leaves are to be taken away. There are three kinds according to the width of the meshes, and used according to the state of the development of the worms. The finest meshed ones are made of silk, the middle ones of hempen strings, and the others of thin straw ropes.

They are used in the following way: The net is spread over the worms, and then mulberry leaves are strewn over it. At once the strongest and most active worms climb up through the meshes to reach the fresh food; after a while some more food is given, and the rest get also up above the net. Then this is taken up with both hands by sticks, to which the net is fastened on two opposite sides and carried over with leaves and worms to the new bed, leaving the excrements and old food behind.

Here the net is turned over, and the whole contents fall on to the fresh mat. The net is then directly hung up in some convenient place to dry, and a fresh one is used for the next operation.

KAIKO-TANA.

This is a stand for the Kaikokago or Waraza, and it has four wooden corner-posts, which receive, in round holes or suitable recesses, thin and round bamboo sticks. The length of the posts and the width of the slides vary according to the size of the baskets, and must be convenient for the handling of the same.

WARAZA.

This, a flat, round basket made of very dry rice straw, is used in silkworm rearing for the purpose of protecting the worms from the cold air. It is used chiefly in the northern provinces of Japan, such as *Iwashiro*, *Iwaki*, *Rikuzen*, *Rikuchiu*, *Rikugo*, *Uzen*, and *Ugo*, these being the coldest parts of the country. The baskets are put on a framework with many slides, and they are less expensive than those described hereafter.

COKAIKO-KAGO.

This is a similar bamboo basket, holding also a Kaiko-mushiro; it is of smaller size, and used chiefly in the province of *Shinano* and parts of the adjoining province. One woman alone can handle it.

O'KAIKO-ZAGO.

This is a piece of wicker-work loosely made of bamboo, and forming a very large, rectangular and nearly flat tray, which receives a mat called Kaiko-mushiro; it is chiefly used in the provinces of *Kodsuke* and *Musashi*, but its construction varies a little in different places.

Two women are required to carry one Kago, which is a disadvantage; but on the other side there is a gain in this way, that a greater amount of excrements may be taken away, and food for a greater number of worms may be given at one time.

MABUSHI.

This is the bush in which the worms spin the cocoons, and is made in very different ways. But three kinds are generally used, namely, the Oriwara (folded straw), the Koyeda (small branches), the Musubiwara (straw bent into the shape of a ring). The Oriwara is chiefly used in the provinces of *Musashi* and *Kodsuke*, the Koyeda in *Shinano* and *Kai*, the Musubiwara in *Muttsu*, *Uzen* and *Ugo*, etc.

KIBACHI.

This is a round wooden bowl, which is lacquered inside. Sometimes, when the excrements of the worms are taken away, or at the time when the worms are ready to spin, this implement is used for carrying them away. In the latter case the worms are counted while they are put into the Kibachi, and then brought to their respective bushes. The inside of the bowl being very smooth, the worms cannot creep and escape.

HABOKI.

This is a feather broom made generally of the feathers of a wild bird called "Yamadori," but is also made from feathers of different kinds. Just before hatching time, the cards (tanegami) are wrapped up in a kind of white paper, and the young worms after breaking the shell, get on this paper and then it is opened; the rest of the caterpillars that still cling to the card, are taken off by means of the Haboki.

But there is a different method which is practiced oftener; when the worms are about to break the shell, the card is covered with a thin layer of millet-chaff, and on this, mulberry leaves cut into very small pieces are strewn; then the worms climb up through the chaff to the leaves, and the card being turned upside down, the worms fall with the leaves and chaff on another paper. Those that remain on the card, are compelled to quit their hold by a person beating the upper side of the card with a small stick.

HERIGI.

This is a contrivance to prevent the moths from creeping away from the tanegami, the paper on which the eggs are deposited. The herigi, square sticks, are put along the four sides of the paper, and they are polished in order that the moths do not find a hold for their feet.

TANE-GAMI.

This is the paper on which the eggs are deposited. After the female moths have rejected the contents of the caecum, they are placed on this paper, and enclosed by the herigi. When all the eggs are laid, the papers are hung up in a row on a bamboo stick for ventilation.

TANE-BAKO.

This is a box made of a wood called Kiri-noki, and used for keeping the cards (tane-gami). These are generally put in the box about the end of Autumn. By many breeders, they are, during the coldest time of Winter, taken out again and placed in pure water for 3 or 5 days; after that they are dried in some shady place, and when thoroughly dry and reduced to their former weight, they are placed again in the box.

KUZU WATA TORI-DOGU.

The implement is used for taking the flock-silk off the cocoons. When it is the object to make seeds, this work must be done very carefully, in order that the moths may get easily out of the cocoons.

MESEN-ITO.

This silk is obtained from floss-silk, by drawing this out and twisting it by hand, and afterwards spinning it regularly on a spinning wheel; the mesenito is used for weaving purposes.

ERRATA.

Page 37 line 4 from below, instead of "compiling" read "publishing."

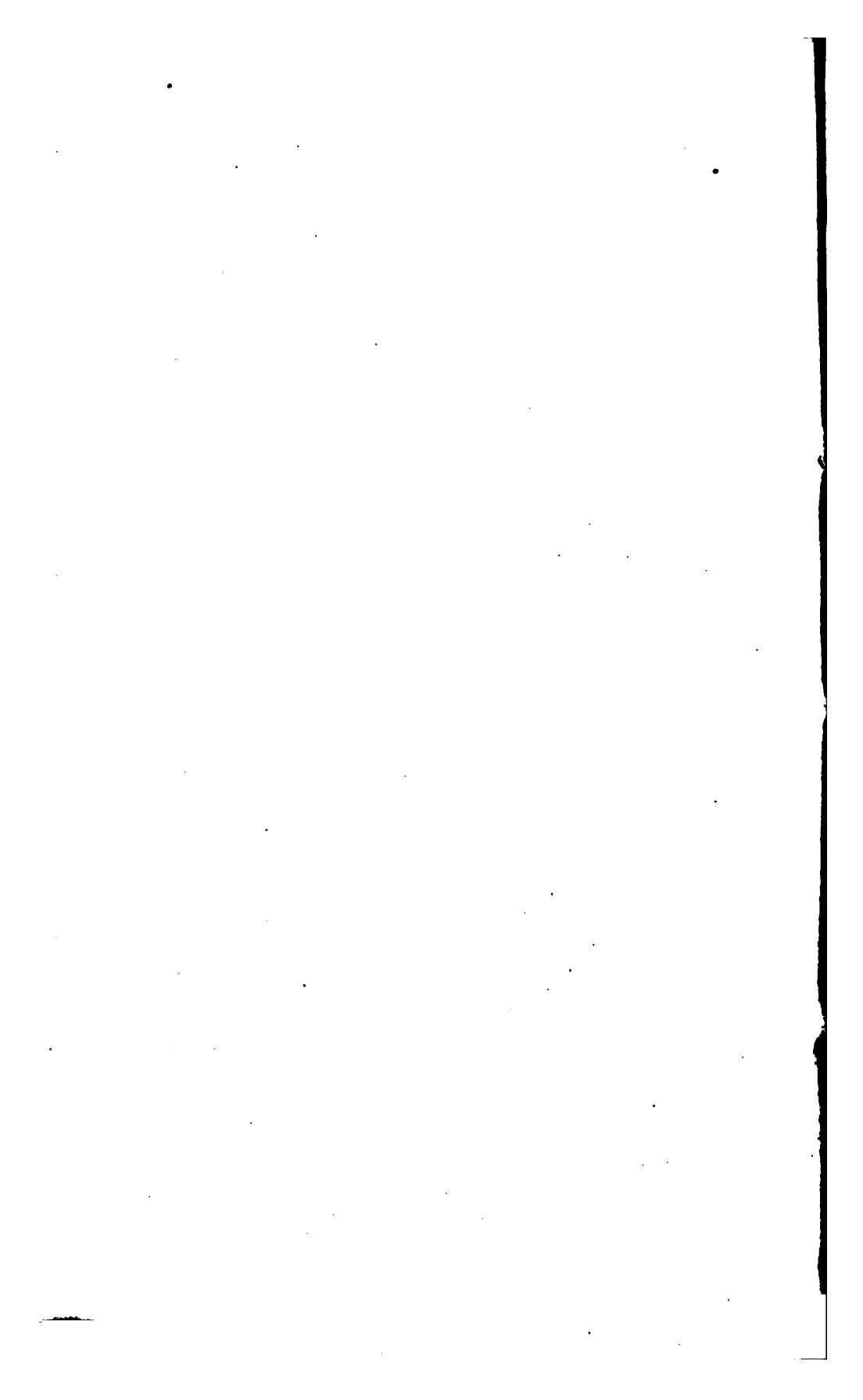
Page 61, line 2 from above, instead of "red, green" read "red, yellow, green."

Page 67, line 8 from above, instead of "cement" read "powdered."

Page 72, line 10 from above, read "peculiar kinds of lacquer are the 'Tsugaru-nuri,' having a marbled surface, etc."

Page 72, line 11 from above, read "and the Wakasa-nuri showing brown colors, etc."

Page 104, line 7 from above, instead of "Amaterasu-no-mikoto" read "Amaterasu-on-kami."



INDEX

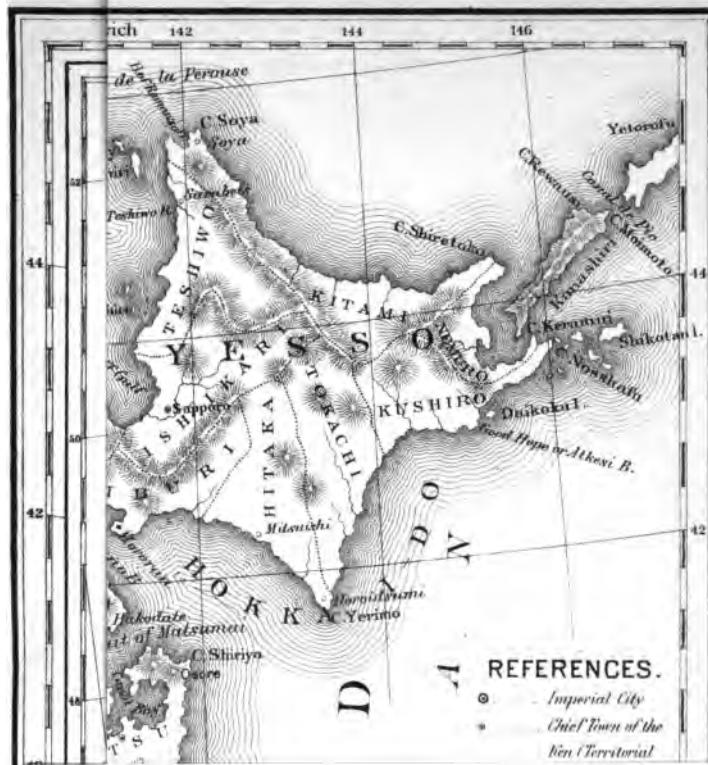
TO THE

Descriptive Notes on Japanese Industry, etc.

SUBJECT.	PAGE.	SUBJECT.	PAGE.
Agar-agar,	109	Dolls,	81
Agriculture, system of,	104	Dyeing of cotton,	75
Alcoholic liquids,	111	Dyeing of silks,	80
Alloys, composition of,	50	Embroideries,	81
Anthracite,	44	Enameled ware,	102
Aqueducts of Tokio,	95	Enamels for painting on porcelain, etc.,	68
Awadji-ware,	63	Engraving,	102
Awata-ware,	62	Fancy articles,	81
Banko-ware,	63	Fans,	82
Basket-ware,	92	Fine arts, historical sketch,	97
Bean-cheese,	110	Flour,	110
Bookbinding,	86	Forests in Japan,	103
Bread,	110	Furniture, etc.,	69
Bronze-casting,	89	Gardening,	114
Bronze-ware, inlaid,	91	Gold and silver ores,	40
Building stones,	45	Gold, metallurgy of,	47
Cement,	45	Gold washing,	41
Ceramics, history,	59	Graphite,	46
Cha-no-yu,	107	Grass cloth,	77
Chemicals,	53	Hemp,	113
Civil engineering,	95	Horticulture,	114
Clay,	46	Indigo, preparation of,	75
Cloisonné enamel,	102	Ink, Japanese,	59
Clothing,	80	Insignia,	92
Coal mines,	43	Iron, metallurgy of,	47
Cobalt ores,	43	Iron ores,	42
Copper, metallurgy of,	49	Isinglass, vegetable,	109
Copper ores,	42	Jewelry,	81
Cotton, cultivation,	112	Joko-jo,	118
Cotton, manufacturing and dyeing, .	75	Jute-hemp,	113
Cotton prints,	75	Kanten,	109
Cotton yarns and fabrics,	74	Kaolin,	46
Deer-skins,	83		

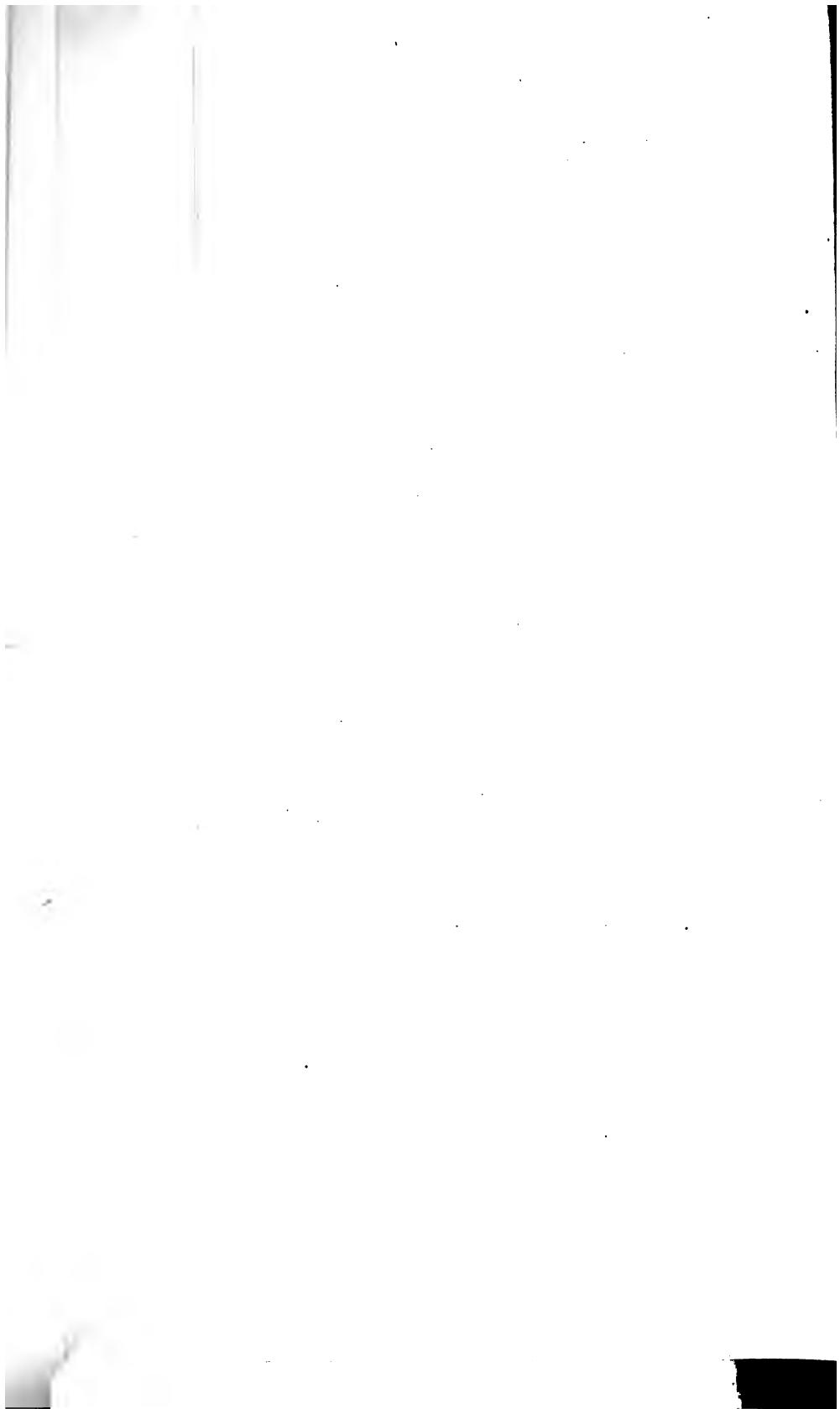
Index.

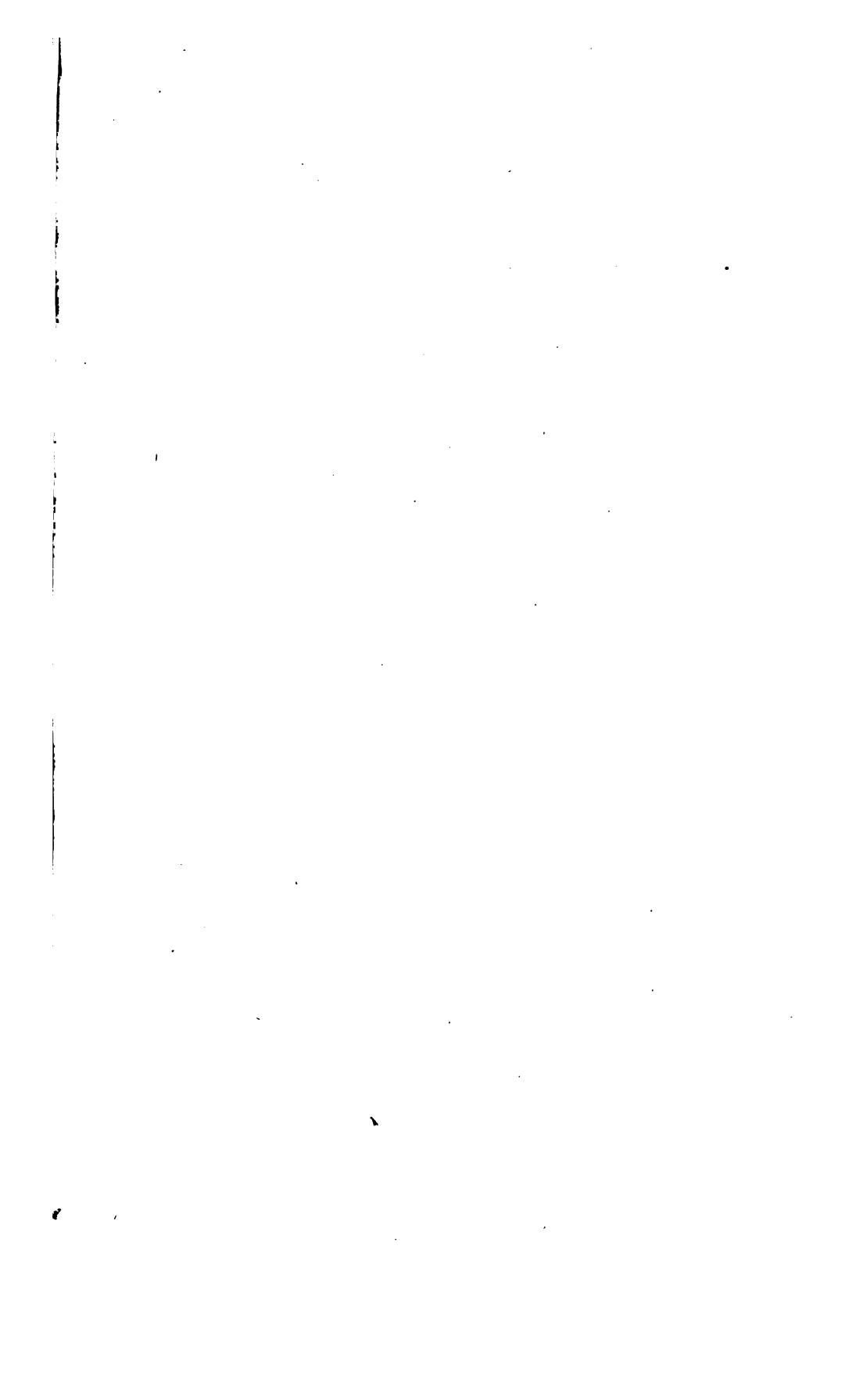
SUBJECT.	PAGE.	SUBJECT.	PAGE.
Kudzu,	110	Porcelain kilns,	65
Lacquer, carvings in red,	72	Porcelain decoration,	68
Lacquer-ware, durability,	117	Pottery, history of,	59
Lacquer, manufacturing of,	58	Potter's wheel,	64
Lacquer-painting,	71	Printing,	86
Lacquer, raw,	57	Ramie,	113
Lacquer-tree,	57	Rice-wine,	111
Lacquer, yellow transparent,	73	Sake,	111
Lacquering, process of,	69	Salt,	53
Lead, metallurgy of,	50	Satsuma ware,	62
Lead ores,	42	Sea-weed,	108
Leather,	83	Shunkei-urushi,	73
Leather, imitation of,	87	Silk, dyeing,	79
Lime, cement, etc.,	45	Silk, history,	77
Linen,	76	Silks, manufacturing of,	78
Lithography,	101	Silk, production of,	113
Manufactures, introduction,	51	Silkworm, breeding of,	119
Mattings,	73	Silver, metallurgy of,	47
Metallurgical products,	47	Silver ores,	40
Metal hollow-ware,	89	Smelting furnaces,	48
Minerals, ores, etc.,	40	Some tsuki (blue porcelain),	67
Mineral waters,	46	Soy,	112
Mines, annual production of,	39	Starch,	110
Mining and metallurgy,	38	Steel, production of,	48
Mining, system of,	38	Stoneware, etc.,	62
Moku-me,	91	Surgical instruments,	89
Money,	96	Swords,	88
Mulberry, cultivation of,	121	Takashima coal,	43
Museums,	93	Tea,	106
Niello-ware,	91	Tea-parties, ceremonial,	107
Oil, mineral,	44	Textile materials,	112
Oils,	55	Tin ore,	42
Ores,	40	Tobacco,	108
Ornaments for coiffures,	82	Umbrella,	83
Paper-cloth,	87	Wall-paper,	86
Paper, imitation of leather,	87	Water supply of Tokio,	95
Papier maché,	92	Wax, vegetable and other kinds,	56
Paper, materials and manufacture,	83	Weights, measures, etc.,	93
Petroleum,	44	Whetstones,	46
Pomology,	103	Women's work,	118
Porcelain,	63	Wooden ware,	92
Porcelain, materials for,	46	Yamamai-silk, use of,	80
Porcelain, preparation of materials,	63		

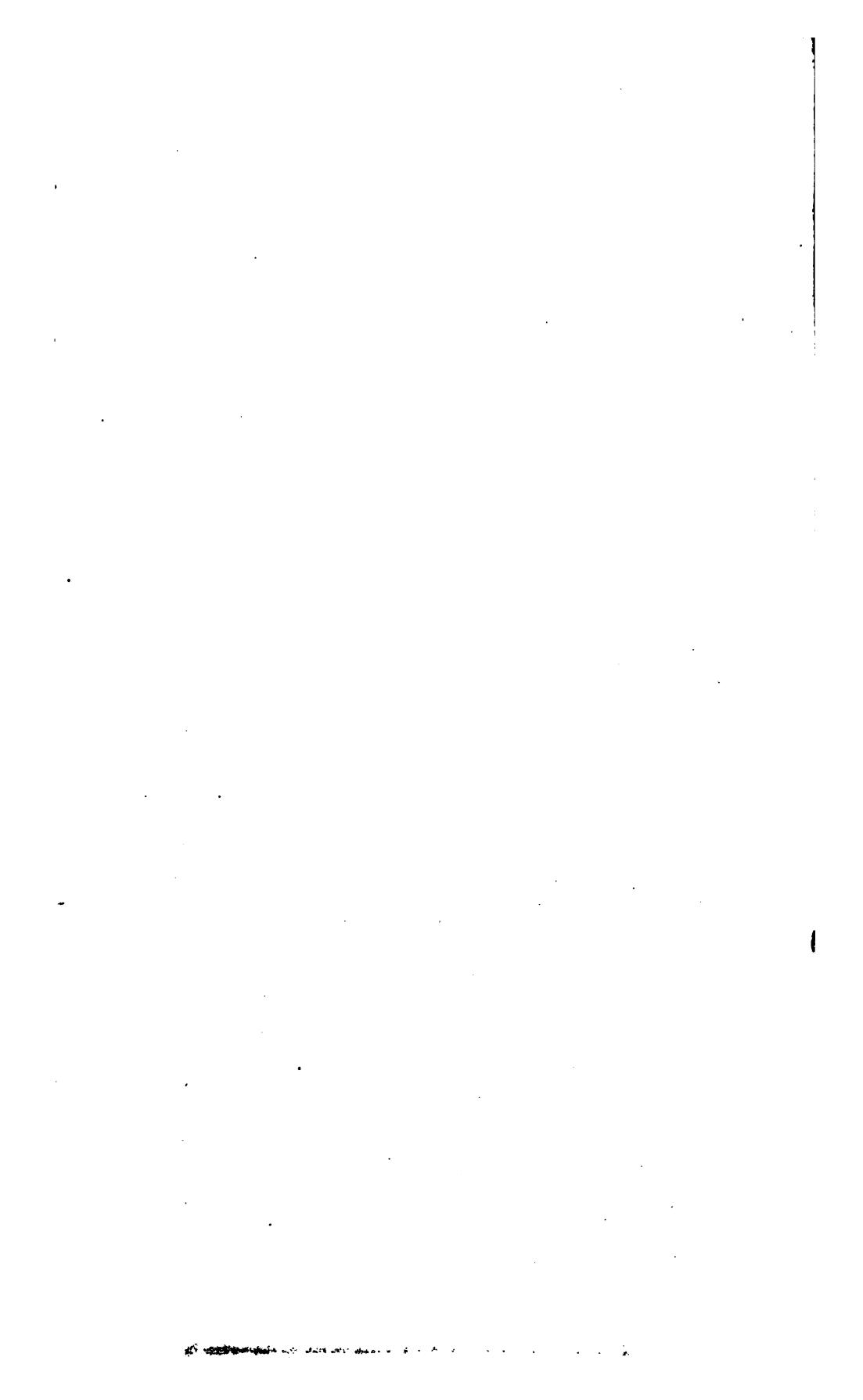


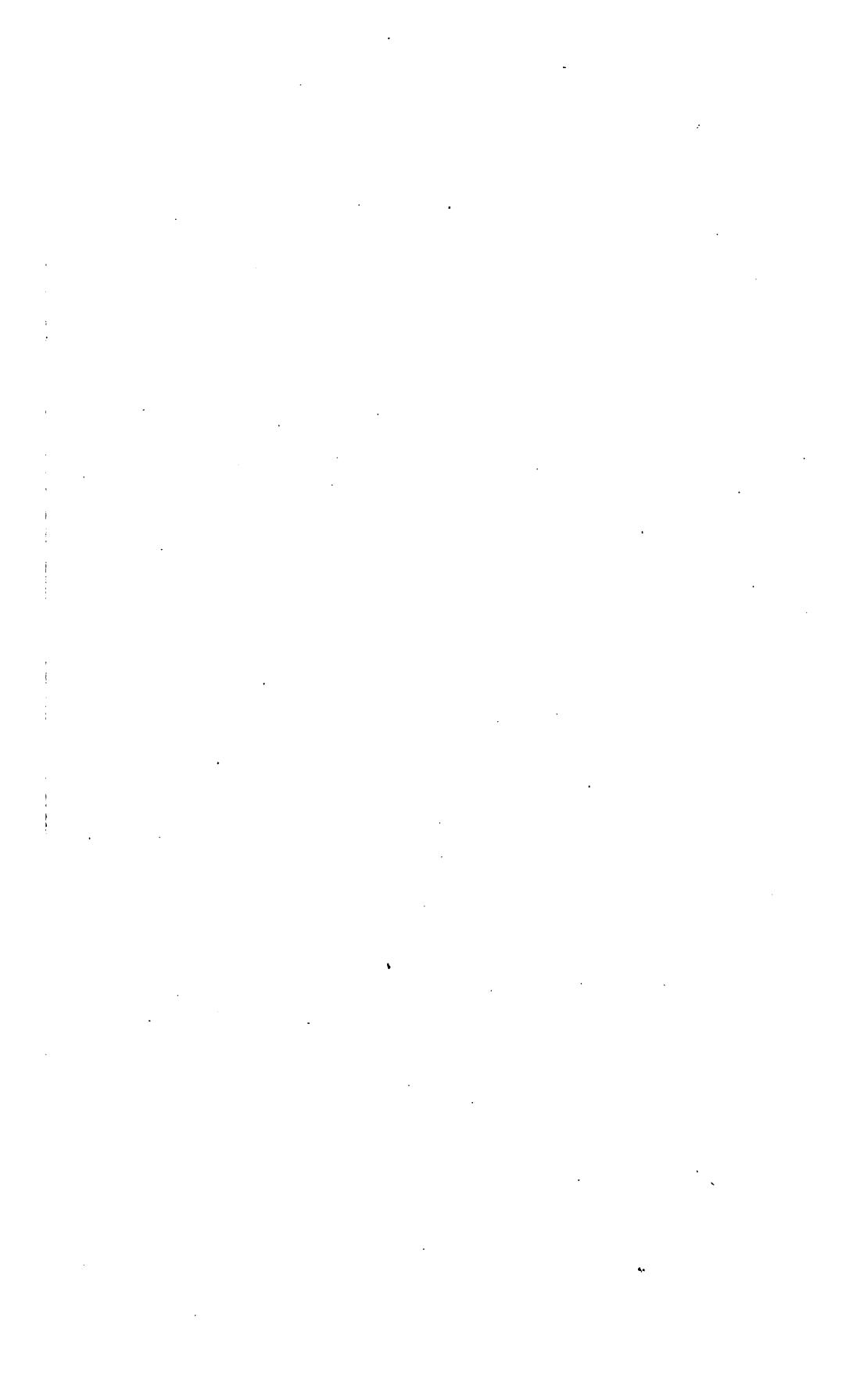
REFERENCES.

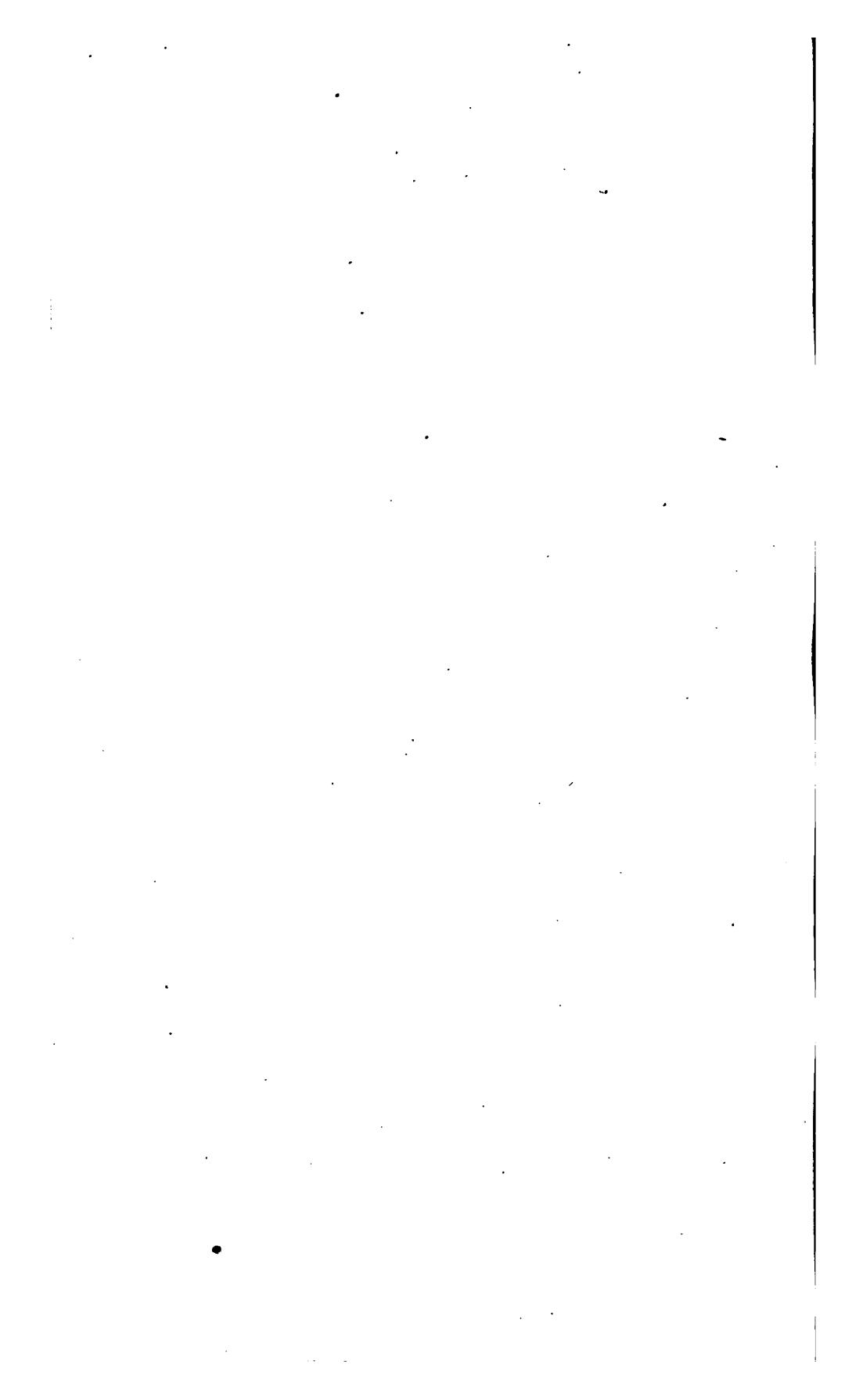
- ◎ Imperial City
- Chief Town of the 'ken' (Territorial)

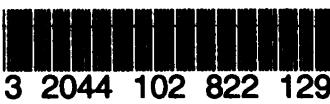












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